ENVIRONMENTAL ASSESSMENT

Integrated Management of Coyote, Red Fox, Feral Dog, Wolf-Hybrid, and Exotic Carnivore Predation On Livestock in the State of West Virginia

Prepared By:
UNITED STATE DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

May 2002

TABLE OF CONTENTS

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, natural systems are being substantially altered as human populations expand and encroach on wildlife habitats. Human uses and needs often compete with wildlife for space and resources, increasing the potential for conflicting human/wildlife interactions. In addition, segments of the public strive for protection for all wildlife; this protection can create localized conflicts between humans and wildlife activities. The *Animal Damage Control* (ADC) *Programmatic Final Environmental Impact Statement* (FEIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1997a):

> *Wildlife has either positive or negative values, depending on varying human perspectives and circumstances...Wildlife is generally regarded as providing economic, recreational and aesthetic benefits...and the mere knowledge that wildlife exists is a positive benefit to many people. However... the activities of some wildlife may result in economic losses to agriculture and damage to property...Sensitivity to varying perspectives and values are required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*

The United States Department of Agriculture (USDA) is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the USDA, Wildlife Services (WS) program is the *Act* of March 2, 1931, as amended (46 Stat. 1468; 7 U.S.C. 426-426b and 426c) and the Rural Development, Agriculture and Related Agencies Appropriations Act of 1988 (P.L. 100-202). WS activities are conducted in cooperation with other Federal, state and local agencies; and private organizations and individuals. Federal agencies, including the United States Department of Interior, Fish and Wildlife Service (USFWS), recognize the expertise of WS to address wildlife damage issues.

Wildlife damage management, or control, is defined as the alleviation of damage or other problems caused by, or related to the presence of wildlife (Leopold 1933, The Wildlife Society 1990, and Berryman 1991). The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as "Integrated Pest Management" or IPM) in which a series of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, 1-7 of the ADC FEIS (USDA 1997a). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that localized populations of the offending species be reduced through lethal methods. Potential environmental impacts resulting from the application of various wildlife damage reduction techniques are evaluated in this environmental assessment (EA).

According to the Animal and Plant Health Inspection Service procedures implementing the National Environmental Policy Act (NEPA), individual actions may be categorically excluded [7 C.F.R. 372.5(c), 60 Fed. Reg. 6,000, 6,003 (1995)]. However, in order to evaluate and determine if there may be any potentially significant or cumulative impacts from the described control program, the Wildlife Services Program in West Virginia has decided to prepare this EA.

The purpose of this EA is to analyze the potential effects of the current integrated predation management program in the State of West Virginia. This analysis relies predominately on existing Federal and State agency publications, information contained in scientific literature, and communications with other wildlife professionals. This EA also cites and is tiered to, the ADC FEIS (USDA 1997a).

All control activities will be in compliance with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act (ESA). Control activities will not negatively impact other protected flora or

fauna. Notice of availability (NOA) of this document will be made consistent with the Agency's NEPA procedures in order to allow interested parties the opportunity to obtain and review this document and comment on the proposed management activities.

WILDLIFE SERVICES PROGRAM

Wildlife Services (WS) is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, *Agreements for Control* or *WS Work Plans* must be completed by WS and the land owner/administrator. WS cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable Federal, state, and local laws and MOU's between WS and other agencies.

Wildlife Services' mission, developed through its strategic planning process, is: 1) to provide leadership in wildlife damage management for the protection of American agriculture, endangered and threatened species, and natural resources, and 2) to safeguard public health and safety (USDA 1997b). The WS Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- close cooperation with other Federal and state agencies;
- training of wildlife damage management professionals;
- development and improvement of strategies to reduce losses and threats to publics from wildlife;
- collection, evaluation, and distribution of wildlife damage management information;
- cooperative wildlife damage management programs;
- informing and educating the public on how to reduce wildlife damage and;
- providing data and a source for limited-use management materials and equipment, including Federal and state registered pesticides.

SUMMARY OF THE PROPOSED ACTION

The proposed action is to continue the current integrated predation management program assisting livestock producers with reducing losses of sheep, cattle, goats, pigs, poultry, and other livestock to predators in the State of West Virginia. The Integrated Wildlife Damage Management (IWDM) approach implements the use of any legal technique or method, used singly or in combination, to meet requester needs for resolving conflicts with coyotes, red foxes, feral dogs, wolf-hybrids, and exotic carnivores (Appendix B). Cooperators requesting assistance are provided with information regarding the use of effective non-lethal and lethal techniques. Most non-lethal methods are best implemented by the livestock producer and the following methods may be recommended by WS: guard dogs, llamas, and donkeys; Electronic Predator Guard (Linhart et al. 1992); fencing; moving livestock to other pastures; birthing in buildings; night penning; habitat alteration; herders and scare devices. Additional methods used by WS, or recommended to producers include shooting, calling and shooting, trapping, snares, dogs, M-44's, Livestock Protection Collars, and gas cartridges. All management actions comply with appropriate Federal, state, and local laws.

1.1 PURPOSE

The purpose of this EA is to analyze the effects of WS activities in West Virginia to reduce predation by coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), feral dogs (*Canis familiaris*), wolf-hybrids (*Canis spp.*), and exotic carnivores (e.g., African cats, wolves, etc.) on livestock (e.g., sheep, goats, cattle, pigs, horses) and poultry (e.g., chickens, turkeys, fowl), referred herein collectively as livestock.

Biological carrying capacity is the land or habitat's limit for supporting healthy populations of wildlife without degradation to the animals' health or their environment over an extended period of time (Decker and Purdy 1988). Wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations (Decker and Purdy

1988). These terms are especially important in urban areas because they define the sensitivity of a local community to a specific wildlife species. For any given damage situation, there will be varying thresholds by those directly and indirectly affected by the damage. This threshold of damage is a primary limiting factor in determining the cultural carrying capacity. While the State of West Virginia has a biological carrying capacity that may support more than the current number of predators, the cultural carrying capacity is often much lower. In many cases when the cultural carrying capacity is reached or exceeded, improper and sometimes illegal implementation of population control methods (e.g., illegal toxicants or unregulated trapping, shooting and snaring) may be used to alleviate predation to livestock and pets and other public health or safety threats (Loker et al. 1999).

1.2 NEED FOR ACTION

1.2.1 The West Virginia Integrated Predation Management Program

In June 1995, a meeting was held with representatives from state and federal agencies, elected officials, and the public to discuss coyote predation on livestock. At the meeting livestock producers expressed their frustration with their inability, regardless of methods they employed, to control coyote predation on their sheep. At this meeting West Virginia WS was provided an opportunity to describe the Predation Management Workshops that had been developed by WS to educate and train livestock producers about techniques they could employ to minimize coyote predation in addition to training livestock producers in the use of traps and snares. The [redacted] cooperated in this initial effort by WS by issuing non-season coyote depredation permits to livestock producers that attended these training workshops. West Virginia elected representatives that attended this preliminary meeting requested that [redacted] prepare a plan to address coyote predation on livestock.

The [redacted] convened a meeting in July 1995, in response to the West Virginia Legislative Interim Committee's request for information, tools, and options to address the problem of predation on livestock in West Virginia. A committee was appointed with representatives from the [redacted], West Virginia Division of Natural Resources, West Virginia University Cooperative Extension Service, [redacted], [redacted], USDA Wildlife Services, County Commissioners from affected counties, and concerned livestock producers. The Coyote Control Committee, as it was named, adopted a plan that incorporates the principles of integrated wildlife damage management. The components of this plan are:

- Identify and utilize existing and new methods for control
- Pursue registration of the M-44 and Livestock Protection Collar in West Virginia
- Provide technical assistance and training to producers
- Increase producer and agency involvement
- Increase communication between all parties
- Increase formal training to cooperating agencies
- Coyote population management

In the spring of 1996 the West Virginia Integrated Predation Management Program (IPMP) was initiated in 3 eastern West Virginia counties. West Virginia WS responded to 40 sheep producers reporting coyote predation. Sheep losses reported by each of these farmers averaged 27.8 head per farm. (Unpublished MIS data). Through the application of IWDM practices WS was able to reduce predation levels in 1996 to an average of 2.53 head of sheep per farm lost to coyotes. The 1996 predation rate of 2.53 head per farm represents a 91% reduction in predation by coyotes over the 1995 sheep losses. Since 1996 WS cooperators have averaged only 3.6 head of livestock lost per farm to all types of predation (MIS data).

WS has met each of its goals to protect livestock resources in West Virginia. WS has responded to every request for predation management services that has been received. WS personnel will verify the predation complaint and identify the predator responsible. WS evaluates the methods the farmer has employed to stop livestock losses and explains additional methods that can be used to prevent future losses. Other than for shooting, in many cases most farmers will have tried every non-lethal technique they are aware of to stop predation; before WS initiates lethal control each farmer is advised of additional non-lethal techniques that they may not have tried.

In an effort to encourage sheep and goat producers to adopt non-lethal methods, WS and the [redacted] is cooperating in a cost share program to provide a partial reimbursement to the farmer for the purchase of a livestock guarding dog. Since the cost share program was initiated in 1999 a total of 60 shepherds have purchased a livestock guarding dog and been eligible for the cost share. However, this has not prevented livestock predation and WS has been requested to provide lethal control when the guarding dog was unable to stop predation.

Prior to 1996, when the West Virginia IPMP was initiated, WS had developed a training program to provide farmers, agency personnel, and others with predation management information and skills to minimize livestock predation. Non-lethal and lethal control methods were explained and WS trained interested individuals in the proper use of traps and snares to capture coyotes. The WVDNR approved the trapping training and provided farmers with out-of-season permits to trap depredating coyotes. In 1996 this training program became a part of the IPMP and a total of 13,028 individuals have attended predator management educational workshops (unpublished MIS data).

1.2.2 Need to Protect Livestock from Mammalian Predators

In West Virginia, coyotes are non-indigenous, originally ranging in the short grass prairie regions of North America, but by 1970's expanded their range eastward into West Virginia taking advantage of a niche left vacant when red and gray wolves were extirpated (Parker 1995). Today, coyotes are the primary predator of livestock in West Virginia, followed by dogs; however, historically, feral and free-roaming dogs had been the primary predator of livestock. Dog predation on livestock includes pet dogs, feral dogs, and hybrid wolves. Red fox are native to North America; however, they were believed to be native to the spruce-fir forests (Samuel and Nelson 1982). European red fox were brought to North America and released by colonist in the 1600's for sport. Red fox in West Virginia are probably a hybrid of North American and European red fox (Samuel and Nelson 1982). While red or gray fox both may prey on livestock, it appears red fox are primarily responsible for livestock predation in West Virginia.

Although documentation of livestock killed by an escaped exotic carnivore in West Virginia is rare, it is important to address this issue. Trade in exotic animals in West Virginia is common and laws to regulate inter- and intrastate trade require a permit and that the animals be disease-free (WVSCR §20-2-13).

United States: In 2000, NASS (2001) reported livestock inventories and values in the U.S. of 98,048,000 and $67 billion for cattle and calves, 7,026,000 and $668 million for sheep and lambs, 436,000 and $17 million for angora goats, and 59,407,000 and $4.3 billion for hogs and pigs, respectively.

Sheep and lamb losses from predators in the U.S. totaled 273,000 and $16.5 million during 1999 (NASS 2000). Coyotes accounted for 60.7% of these predator losses. Similarly, cattle and calf losses from predators in the U.S. totaled 117,400 head and $39.6 million during 1995 (NASS 1996). Coyotes and dogs accounted for 59% and 19% of these predator losses, respectively. Coyotes were also the largest predator of goats, accounting for 35.6% of predator losses (NASS 2000). The value of goats lost from all predators was $3.4 million.

West Virginia: In 1999, West Virginia ranked 27th in sheep production and ranked 39th in cattle production in the U.S. West Virginia sheep operations had a total value of production of $3.2 million and cattle operations had a total value of production of $61.6 million (NASS 2000).

Livestock predation is primarily to sheep, goats, and cattle. However, swine, foals and range raised fowl are occasionally preyed upon by coyotes, foxes, or dogs. Coyotes accounted for 77.8% of all predator-killed calves in West Virginia in 2000 (NASS 2001) and 37.5% and 64.3% of all predator-killed ewes and lambs, respectively in West Virginia in 1999 (NASS 2000). Dogs accounted for 50% and 25% of all predator-killed ewes and lambs, respectively in West Virginia in 1999 (NASS 2000). In FY2001 West Virginia WS responded to requests from 133 cooperators and provided direct control assistance for coyote predation on sheep, goats, and calves. Five of these cooperators had a feral dog problem in addition to the coyote problem (unpublished MIS data).

From 1993-2001, the West Virginia WS program has provided technical assistance or direct control assistance in response to 1,401 incidents of predation on livestock by coyotes (n = 1,348), red foxes (n = 17), and feral dogs (n = 36) (unpublished MIS data) (Table 1-1).

Table 1-1. Number of damage reports received by West Virginia Wildlife Services for major carnivores by year.

Fiscal Year	Species			Total
	Coyote	Feral dog	Red fox	
1993	19	4	0	23
1994	11	0	3	14
1995	21	2	2	25
1996	110	1	4	115
1997	74	0	3	77
1998	207	8	1	216
1999	242	4	0	246
2000	296	12	1	309
2001	368	5	3	376
Total	1348	36	17	1401

1.2.2.1 Impacts to the Sheep Industry

McConnell (1995) reported that predation increases the annual maintenance cost per breeding ewe by 12%. Costs associated with livestock protection includes labor, loss of genetic stock, time (in months or years) to replace lost animals, implementation of wildlife management practices to reduce damage or the threat of damage, and long distance calls to government agencies to seek assistance.

In a 1982 presentation, "Economic Effect on the Family, the Community, and the County," Dr. Robert Kensing, an economist with the Texas Agricultural Extension Service, reported, "Predation is a major cause of the almost complete liquidation of sheep and goat [operations] from central Texas." Kensing (1982) also reported that most sheep and goat operations are family farms, and the effects of predation on these operations include a decline in total income,

loss of benefits from diversification, and the necessity to seek off-farm income. In addition, when these operations are discontinued, the family loses the opportunity to work together, a factor benefiting family life.

During the summer of 1995 a total of 406 West Virginia shepherds participated in a survey designed by Thomas McConnell of The West Virginia University Cooperative Extension Service to evaluate the effect of predation on West Virginia livestock producers. The survey indicated that during the 1994-1995 season, shepherds lost an estimated 4,630 lambs and ewes to coyote predation, a total economic loss of $329,050.00. A NASS 1995 survey of Sheep and Goat Predator Loss for West Virginia reported a total of 2,300 lambs and ewes lost to coyote predation It appears that the NASS survey under reported sheep losses to coyotes by 100%. McConnell (1995) said that on a percentage basis, the most recent years of decline in sheep numbers has been at a higher rate than any other time in West Virginia agricultural history. The 1995 survey also found that 51% of the shepherds surveyed reported that one or more of their neighbors left the sheep business because of sheep losses to predators The conclusion of the 1995 Survey was that unless predation losses can be minimized, West Virginia shepherds cannot sustain this high level of predation and will continue leaving the sheep business, resulting in a net economic loss to livestock producers and to the State of West Virginia (McConnell 1995).

Sheep and lambs remain vulnerable to predation throughout the year, particularly from coyotes and dogs (Henne 1977, NASS 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983). Lambs are vulnerable to red fox predation during the early stages of spring and fall lambing seasons. Without actions to control predation losses, studies reveal that losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3%, respectively (Henne 1975, Munoz 1977, O'Gara et al. 1983). The National Agricultural Statistics Service and the American Sheep Industry Association report that predation increases the annual maintenance cost per breeding ewe by 12%. Conversely, other studies indicate that sheep and lamb losses are much lower where wildlife damage management is applied (NASS 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). NASS (2000) reported sheep and lamb losses from predators in the U.S. totaled 273,000 during 1999. This represented 36.7% of the total losses from all causes and resulted in a loss of $16.5 million to farmers and ranchers. Coyotes and dogs accounted for 60.7% and 15.1% of the total sheep and lamb losses to predators, respectively.

NASS (2000) reported 700 and 2,500 sheep and lambs lost to coyotes and dogs in West Virginia, respectively. The lost value of the sheep totaled $176,600. If a farmer can prove a sheep was killed by a dog they can be reimbursed by the county where the loss occurred. No consolidated data exists on the number of sheep lost to dogs and reimbursed by each county.

In FY2000, 121 cooperators requested IPMP service from WS and had a loss of 277 sheep to coyotes before the predation was stopped (unpublished MIS data). NASS (2000) reported the lost value of these sheep totaled $14,663. In FY2001 the 133 cooperators in the IPMP lost 386 sheep to predators before the predation was stopped (unpublished MIS data). NASS (2001) reported the total value of the 386 sheep lost to predators was $37,056. Based on predation rates prior to 1996 it is estimated that without a predation management program these same farmers could have lost 4,000 sheep valued at $384,000 (MIS data & NASS 2001). Most substantial is the value of the sheep protected by WS on the farms of these 133 cooperators. NASS (2001) provided estimates of the average value of sheep in West Virginia and WS protected sheep that had a total value of $1,768,704.00.

1.2.2.2 Impacts to the West Virginia Cattle Industry

In 2000, NASS (2001) reported 147,00 head of cattle were lost to animal predators in the U. S., totaling $51.6 million dollars. Coyotes accounted for 64.6% (95,000 head) of the total cattle and

calves lost to predators. Dogs were the second leading cause for cattle and calves lost to predators, accounting for 17.7% (26,000 head).

NASS (2001) reported 900 calves lost to predators in West Virginia in 2000. The lost value of these calves totaled $236,000 with an average market value of $262/head. Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they get older and larger (Shaw 1977, 1981, Horstman and Gunson 1982). Many West Virginia farmers begin calving during January when coyote food requirements are at their highest level Also many WS cooperators that have sheep and goats also raise cattle and calves. During FY2001 WS cooperators reported losing only 12 calves to coyotes (MIS data) while WS protected calves on cooperator farms from coyote predation with an estimated value of $522,166.00.

1.2.2.3 Impacts to the Goat Industry

Coyotes and dogs are the largest predators of goats in 3 major goat producing states (AZ, NM, and TX) accounting for 35.6% and 17.5% of predator losses, respectively (NASS 2000). The value of goats lost in those 3 states from all predators was $3.4 million.

No NASS data is available for goat production in West Virginia. However, WS observed that goat production is growing in West Virginia each year (unpublished MIS data). West Virginia is especially well suited for goat production with a wide range of preferred forages on rugged mountain pastures. Many cooperators are raising goats with sheep and cattle as part of a multi-grazing system and using the goats to control vegetation that cattle or sheep will not eat. No value has been established for this pasture maintenance that would otherwise require the use of chemical herbicides. During FY2001, WS cooperators lost a total of 104 goats to coyote predation. WS protected goats on cooperator farms with an estimated value of $44,000.00. NASS did not report a value for goats in West Virginia so WS used cooperator estimates of goat values.

1.2.2.4 Impacts to Other Livestock

In West Virginia, coyotes, foxes, and dogs have attacked, killed, or injured other livestock including: foals, range raised fowl and poultry, and hogs (unpublished MIS data).

1.2.3 Summary of Coyote, Fox, Dog, Wolf-hybrid, and Exotic Carnivore Predation on Livestock

The need exists for effective management of predation associated with coyotes, red foxes, feral dogs, wolf-hybrids, and exotic carnivores on livestock because livestock producers lack expertise and specialized equipment to capture these animals. Additionally, livestock producers do not have the appropriate certifications to use some methods to effectively stop predation. Livestock producers also have limited time to devote to developing expertise to remove livestock predators. Large livestock operations also have a need to efficiently use large acreage to cost effectively raise livestock for profit. The large number of animals raised by large livestock operations may prohibit effective use of some non-lethal methods (e.g., night penning) because of labor, time constraints, and disease concerns.

Predator management can become very complex because of the numerous jurisdictions involved when assisting property owners throughout a state. Local, state, and Federal agencies should be involved or notified when implementing an IWDM program, and restrictions by those agencies must be incorporated into the IWDM program. Additionally, threatened and endangered species must be considered when implementing any IWDM program. Some IWDM methods can only be implemented by the WS program, as legal restrictions prevent livestock producers from using some tools (e.g., M-44's and Livestock Protection Collars) in West Virginia.

At this time, the M-44 is West Virginia's most useful predation management tool. Traps and snares are the second and third most useful tools, respectively, when use restrictions for the M-44 cannot be met. The Livestock Protection Collar is not used very often but is a very important tool to target specific coyotes that are not responding to other methods or restrictions on the use of other tools precludes their use at a particular site. The reduction in predation rates through the use of integrated predation management tools have proven to be effective in targeting and removing offending predators.

1.3 WEST VIRGINIA WILDLIFE SERVICES OBJECTIVES

The need to manage predator impacts on livestock and poultry in West Virginia was used by WS to define the objectives for the WS program in West Virginia:

- Respond to 100% of the requests for assistance with the appropriate action (technical assistance or direct control) as determined by West Virginia WS personnel, applying the WS Decision Model (Slate et al. 1992).
- Reduce coyote, fox, dog, wolf-hybrid, and exotic carnivore predation on livestock and poultry in West Virginia to the greatest extent possible on properties where WS assistance is requested.
- Minimize the lethal take of non-target species.
- Encourage livestock producers to adopt non-lethal control methods.
- Provide predator management workshops to livestock producers and agency personnel.

1.4 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

1.4.1 ADC Programmatic Environmental Impact Statement

WS has issued a FEIS on the national APHIS/WS program (USDA 1997a). This EA is tiered to the FEIS. Pertinent information available in the FEIS has been incorporated by reference into this EA.

1.5 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should the West Virginia WS program continue to provide integrated predation management to livestock producers with losses from predators to meet the need for livestock protection?
- If not, how should WS fulfill its legislative responsibilities for managing predation on livestock in West Virginia?
- Would the proposed action to continue the integrated predation management program by WS for West Virginia livestock producers experiencing predator losses have any significant impacts requiring preparation of an EIS?

1.6 RELATIONSHIP OF AGENCIES DURING PREPARATION OF THIS EA

Based on agency relationships, MOU's and legislative authorities, the West Virginia WS program is the lead agency for this EA, and therefore, responsible for the scope, contents and decisions made. The [redacted] and WVDNR contributed input throughout the EA preparation to ensure an interdisciplinary approach in compliance with NEPA, and agency mandates, policies, and regulations.

1.7 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.7.1 Actions Analyzed

This EA evaluates coyote, red fox, feral dog, wolf-hybrid, and exotic carnivore damage management by WS to protect livestock on private land or public facilities within the State of West Virginia wherever such management is requested to the West Virginia WS program.

1.7.2 American Indian Lands and Tribes

Currently WS does not have any MOU's or signed agreements with any American Indian tribe in West Virginia. If WS enters into an agreement with a tribe for predator damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.7.3 Period for Which this EA is Valid

This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS activities.

1.7.4 Site Specificity

This EA analyzes potential impacts of the West Virginia WS program activities that will occur or could occur on private property sites or at public facilities within the State of West Virginia. Because livestock production occurs throughout West Virginia and coyotes are found in every county in the State of West Virginia (Warner et al. 2001), it is conceivable that WS direct control activities could occur anywhere in the State. Thus, this EA analyzes the potential impacts of such efforts wherever and whenever they may occur in the State of West Virginia and this EA emphasizes significant issues as they relate to specific areas whenever possible. However, the substantive issues that pertain to the various types of coyote, red fox, feral dog, wolf-hybrid, and exotic carnivore predation on livestock and resulting management are the same, for the most part, wherever they occur, and are treated as such. The substantive issues analyzed in this EA were: effects on target (coyote and red fox) species populations; effects on dogs, wolf-hybrids, and exotic carnivores; effects on non-target wildlife populations, including threatened and endangered (T&E) species; effects on human health and safety; humaneness of control methods used by WS; and effects on aesthetic values of target and non-target species. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS in the State of West Virginia (See USDA 1997a, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and SOP's described herein and adopted or established as part of the decision.

1.7.5 Public Involvement/Notification

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through “Notices of Availability” (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.8 AUTHORITY AND COMPLIANCE

1.8.1 Authority of Federal and State Agencies for Coyote, Red Fox, Feral Dog, Wolf-hybrid, and Exotic Carnivore Livestock Damage Management in the State of West Virginia

See Chapter 1 of USDA (1997a) for a complete discussion of Federal laws pertaining to WS.

1.8.1.1 Wildlife Services Legislative Mandate

The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, which provides that:

"The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "*bringing (damage) under control*," rather than "*eradication*" and "*suppression*" of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

1.8.1.2 U.S. Department of Interior, Fish and Wildlife Service Legislative Mandate

The USFWS authority for action is based on the Migratory Bird Treaty Act of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President."

The authority of the Secretary of Agriculture with respect to the Migratory Bird Treaty was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 Fed. Reg. 2731, 53 Stat. 1433.

CFR 50 Subchapter C - The National Wildlife Refuge System - Part 30 - Feral Animals - Subpart B-30.11 - Control of feral animals states: (a) Feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized Federal or state personnel or by private persons

operating under permit in accordance with applicable provisions of Federal or State law or regulation.

1.8.1.3 Mission of the [redacted]

[redacted].

The [redacted] currently has a MOU with WS which established a cooperative relationship between WS and the [redacted], outlines responsibilities, and sets forth annual objectives and goals of each agency.

1.8.1.4 Mission of the West Virginia Division of Natural Resources

It is declared to be the public policy of the State of West Virginia that the wildlife resources of this State shall be protected for the use and enjoyment of all the citizens of this State. All species of wildlife shall be maintained for values which may be either intrinsic or ecological or of benefit to man. Such benefits shall include (1) hunting, fishing and other diversified recreational uses; (2) economic contributions in the best interests of the people of this State; and (3) scientific and educational uses (WVCSR §20-2-1).

The WVDNR currently has a MOU with WS which established a cooperative relationship between WS and the WVDNR and outlines responsibilities, and sets forth annual objectives and goals of each agency.

1.8.2 Compliance with Other Federal Laws

Several other Federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.8.2.1 National Environmental Policy Act

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in West Virginia. When WS operational assistance is requested by another Federal agency, NEPA compliance is the responsibility of the other Federal agency. However, WS could agree to complete NEPA documentation at the request of the other Federal agency.

1.8.2.2 Endangered Species Act

It is Federal policy, under the Endangered Species Act (ESA), that all Federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)) (Appendices C and D list Federal and State listed T&E species in West Virginia). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). WS obtained a Biological Opinion (BO) from the USFWS in 1992 describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997a).

1.8.2.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The law prohibits any "take" of the species, except as permitted by the USFWS or by Federal agencies within the scope of their authority.

1.8.2.4 Federal Insecticide, Fungicide, and Rodenticide Act

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used or recommended by the WS program in West Virginia are registered with, and regulated by, the EPA and WVDA, Pesticide Division and are used by WS in compliance with labeling procedures and requirements.

1.8.3 Compliance with Other State Laws

1.8.3.1 Dog Running at Large

This law (WVCSR §19-20-13) states that *"Any owner or keeper of any dog who permits such dog to run at large shall be liable for any damages inflicted upon the person or property of another by such dog while so running at large.*

1.8.3.1 Dog Killing or Worrying Livestock or Poultry

This law (WVCSR §19-20-14) states that *"If any dog shall have killed or assisted in killing, wounding or worrying any sheep, lambs, goats, kids, calves or poultry out of the enclosure of the owner of such dog, the owner or keeper of such dog shall be liable to the amount of such sheep, lambs, kids, calves or poultry in the amount of the damages sustained...."*

1.8.3.3 When Lawful to Kill Dog

This law (WVCSR §19-20-16) states that *"Any person may kill any dog that he may see chasing, worrying, wounding or killing any sheep, lambs, goats, kids, calves or poultry outside of the enclosure of the owner of such dog, unless the same be done by the direction of the owner of such sheep, lambs, goats, kids, calves or poultry."*

1.8.3.4 Licenses and permits.

This regulation (WVCSR §20-2-72) states that *" Except as otherwise provided by law, no resident who has reached his fifteenth birthday and who has not reached his sixty-fifth birthday, and no nonresident shall at any time take, hunt, pursue, trap for, kill or chase any wild animals, wild birds, or fish for, take, kill or catch any fish, amphibians or aquatic life of any kind whatsoever in this Sate without first having secured a license or permit..."*

1.8.3.5 Definition of Wildlife

WVCSR §20-1-2 defines "wild animal" to mean *"all mammals native to the state of West Virginia occurring either in a natural state or in captivity, except house mice or rats."*

1.8.3.6 Wildlife Damage Control Agents

This regulation (WVCSR §20-2-50a) states that *"The director may issue a license to a person to act as a wildlife damage control agent. Unless otherwise prohibited by law, any person licensed as a wildlife damage control agent, acting pursuant to the license and subject to the rules promulgated by the director, is authorized to take and dispose of wildlife found by the wildlife damage control agent to be creating a nuisance in or around homes, businesses and other places where the presence of wildlife may be a nuisance."*

1.8.3.6 Use of chemicals, biological compounds or devices on free roaming wildlife populations for fertility control.

This regulation (WVCSR §20-2-5d) states that "*notwithstanding any other provisions of this code and except as specifically authorized by the director in consultation with the wildlife resources section of the division, it is unlawful for anyone to administer any chemical, biological compound or device to free roaming or non captive wildlife for the purpose of fertility control.*"

1.8.3.7 Importation of Wildlife

"No person shall transport into or have in his possession within this State any live wildlife or viable eggs thereof from without the State, except as authorized by an importation permit issued by the director: Provided, That the director shall not be authorized to issue a permit to any person to transport into this State any coyotes (Canis latrans)." (WVCSR §20-2-13).

1.8.3.7 Hunting, trapping or fishing on lands of another.

"It shall be unlawful for any person to shoot, hunt, fish or trap upon the fenced, enclosed or posted grounds or lands of another person or to peel trees or timber, build fires or do any other act or thing thereon in connection with or auziliary to shooting, hunting, fishing or trapping on such lands without permission in writing from the owner, tenant or agent of such owner, and every person hinting, fishing, shooting or fowling upon such lands shall have in his possession such written permission when so doing." (WVCSR §20-2-7).

1.8.3.8 Permit to kill deer or other wildlife causing damage to cultivated crops, trees, commercial nurseries, homeowners' shrubbery and vegetable gardens; weapon restrictions.

"In addition to the foregoing, the director shall establish procedures for the issuance of permits or other authorization necessary to control deer or other wildlife causing property damage." (WVCSR §20-2-15b).

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues, including those that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), and those that were used to develop mitigation measures and/or SOP's, and the issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional descriptions of affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

Various issues cause concern with the public and/or professional communities about potential environmental problems that might occur from a proposed Federal action. Such issues must be considered in the NEPA decision process. Issues relating to the management of wildlife damage were raised during the scoping process in preparing the programmatic ADC FEIS (USDA 1997a) and were considered in the preparation of this EA. These issues are fully evaluated within the FEIS, which analyzed specific data relevant to the West Virginia WS program.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action may include any property owner or manager who has suffered damage or loss of livestock or poultry from predators within the State of West Virginia. Control areas may include Federal, state, county, city, private, or other lands, where WS assistance has been requested by a landowner or manager to control predator damage to livestock or poultry. The control areas may also include property in or adjacent to identified sites where predation activities could cause damage or losses to livestock. Predator damage control may be conducted when requested by a landowner or manager, and only on properties with a Cooperative Agreement with WS.

2.2 ISSUES ADDRESSED IN DETAIL IN CHAPTER 4

Potential environmental impacts of the Proposed Action and Alternatives in relation to the following issues are discussed in Chapter 4. The following issues have been identified as areas of concern requiring consideration in this EA.

- Effects on Target (Coyote and Red Fox) Species Populations
- Effects on Dogs, Wolf-hybrids, and Exotic Carnivores
- Effects on Non-target Wildlife Populations, including T&E Species
- Effects on Human Health and Safety
- Humaneness of Control Methods Used by WS
- Effects on the Aesthetic Values of Target and Non-target Species

2.2.1 Effects on Target (Coyote and Red Fox) Species Populations

Some persons and groups are concerned that the proposed action or any of the alternatives would result in the loss of local coyote and red fox populations or could have a cumulative adverse impact on regional or statewide populations. Based upon anticipated work, no more than 100 red fox and 500 coyotes are likely to be killed by WS use of lethal control methods under the proposed action or any of the alternatives in any one year.

The WVDNR Assistant Chief of Game Management was consulted in regards to any potential or suspected adverse impacts that would result from WS proposed action. It was determined by the WVDNR that WS proposed action or any of the alternatives would not significantly impact coyote or red fox populations in the State of West Virginia (P. Johansen, WVDNR, Pers. Comm.). Additionally, the

affect of the proposed action on those populations is localized and would not adversely affect adjacent predator populations.

2.2.2 Effects on Dogs, Wolf-hybrids, and Exotic Carnivores

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage control methods and activities on dogs, wolf-hybrids, and exotic carnivores. Feral, abandoned, and liberated dogs, wolf-hybrids, and exotic carnivores are considered ownerless, living in a semi-wild or wild state, and without the care of an owner.

The ownership of dogs as pets and hunting companions has a long tradition in West Virginia. Since there are many feral and unwanted dogs in West Virginia, local government and humane societies must euthanize thousands of dogs annually. The State of West Virginia does not compile data from each county on the number of dogs euthanized. Some dogs are feral, others are abandoned, and some such as wolf-hybrids have been liberated. WS SOP's include measures intended to mitigate or reduce the effects on non-target species populations, including pet dogs and hunting dogs, and are presented in Chapter 3.

Livestock producers and dog owners are very sensitive to the issue of dogs killing livestock because of the brutal means in which dogs kill or injure livestock, the attachment pet owners place on dogs, monetary losses incurred by livestock producers from dog damage, the difficulty some pet owners have in accepting responsibility for actions of their dogs, and the legal responsibility and liability dog owners bear for controlling their animals. Special efforts are made to avoid harming dogs not involved in livestock depredation. Some dogs kill or injure livestock, but rarely usually dogs will not feed upon livestock. However, it is not uncommon for dogs to kill or injure many livestock in a short period of time. Where dogs are killing or injuring livestock, lethal or non-lethal control methods may be implemented by livestock producers, local animal control officers, WS, and others to protect livestock.

The public is concerned that some dogs involved in killing or injuring livestock may be killed. WVCSR §19-20-16 states that dogs may be killed for injuring or killing livestock, poultry, or other domestic animals and the owner of that dog is responsible for damages. Moreover, the public is concerned innocent dogs may be inadvertently killed by some control methods. Pet dogs and dogs used for legal hunting are believed by some people to be especially at risk. However, WVCSR §20-2-7 states,

"It shall be unlawful for any person to shoot, hunt, fish or trap upon the fenced, enclosed or posted grounds or lands of another person or to peel trees or timber, build fires or do any other act or thing thereon in connection with or auxiliary to shooting, hunting, fishing or trapping on such lands without permission in writing from the owner, tenant or agent of such owner, and every person hunting, fishing, shooting or fowling upon such lands shall have in his possession such written permission when so doing."

Therefore, since WS activities will be communicated to the property owner and adjoining landowners, and hunters which are pursuing game on those properties must have permission from the landowners, it is unlikely that WS activities will impact pet dogs and hunting dogs of law-abiding citizens.

WS reviewed MIS data since 1996 and examined the likelihood that hunting dogs would be exposed to control methods resulting in unintentional death. A review of all control methods (described in detail in Appendix B) identified M-44, Livestock Protection Collar (LPC) and guard animals as methods which may result in the unintentional death of a hunting dog or free-ranging pet. The M-44 and LPC are registered for use in West Virginia and are used by WS under strict guidelines (see SOP's in Chapter 3) and are only used on private property within a fenced area. In addition, it is the policy of the West Virginia WS that M-44's are not set from November 1 thru December 31 when the greatest number of conflicts with sportsman are likely to occur. However, if there is a need for the use of M-44's during this

time period then the WVDNR is notified. Guard animals may be recommended by WS, but implementation would be the landowner's responsibility.

The LPC is designed to target those predators which are in the act of killing livestock; therefore, if a dog was in a fenced pasture where LPC's were on livestock that dog would have to bite the necks of those livestock where the LPC was located. However, because livestock producers may legally kill a dog for chasing, injuring, or killing livestock (WVCSR §19-20-16), it is the dog owners responsibility to avoid these situations. Since 1996 when LPC's were legalized in West Virginia no dogs of any type have been killed by LPC's (unpublished MIS data). Based on this analysis, SOP's and state policies were developed (see SOP's in Chapter 3).

2.2.3 Effects on Non-Target Wildlife Populations, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the potential for damage control methods and activities used in the proposed action or any of the alternatives to inadvertently capture or remove non-target animals, or to potentially cause adverse impacts to non-target species populations, particularly T&E Species. WS mitigation and SOP's are designed to reduce the effects on non-target species populations and are presented in Chapter 3. To reduce the risks of adverse impacts to non-target species, WS select damage management methods that are as target species-specific as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating control techniques, WS select locations which are extensively used by the target species and use baits or lures which are preferred by the target species.

There is a risk of non-target species being taken whenever lethal control methods are employed to stop livestock predation. The WVDA registered the M-44 and Livestock Protection Collar for use by WS personnel only as a means of preventing adverse environmental affects. The use restrictions that accompany the use of these two pesticides are designed to prevent risks to the public and minimize the take of non-target animals while targeting the offending predator. The WVDNR has issued non-season trapping permits to WS personnel allowing WS to address predation complaints with traps and snares. WS takes an average of 50 non-target animals each year on farms throughout West Virginia that are experiencing livestock predation. WS removes approximately 2.4 depredating coyotes for each non-target animal that is taken (unpublished MIS data) (P. Johnasen, WVDNR, Pers. Comm.) (Table 2-1).

Table 2-1. Non-target take by WV WS by year and species.

	Species									
Year	Raccoon	Red Fox	Gray Fox	Bobcat	Woodchuck	Dog	Skunk	Deer	Bear	Opossum
1996	2	1	5	0	0	0	0	0	0	0
1997	11	4	3	0	0	0	0	1	0	2
1998	20	21	11	1	1	1	0	0	0	0
1999	20	17	31	2	1	1	2	0	2	0
2000	15	20	24	5	0	0	2	2	1	5
2001	29	15	17	2	1	1	1	1	0	0
Total	97	78	91	10	3	5	5	4	3	8

Special efforts are made to avoid jeopardizing T&E Species through biological evaluations of the potential effects and the establishment of special restrictions and mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WS IWDM methods on T&E species and has obtained a Biological Opinion (BO) (USDI 1992). For the full context of the BO, see Appendix F of the ADC FEIS (USDA 1997a). WS is also in the process of reinitiating Section 7 consultation at the National level to assure that potential effects on T&E species have been adequately addressed.

Based on the conclusions made by USFWS during their 1992 programmatic consultation of WS' activities and subsequent BO, it was determined that management activities being utilized for predator damage management in West Virginia are not likely to adversely affect the T&E species listed in West Virginia. Furthermore, as stated in the 1992 BO, the USFWS has determined that the only method that might adversely affect the bald eagle was above ground use of strychnine treated bait for "nuisance birds." Strychnine is no longer registered for above ground use and would not be used by WS in the State. Therefore, WS predator damage management activities in West Virginia are not likely to have adverse effects on bald eagles. Furthermore, West Virginia WS has determined no effect on those West Virginia T&E species not included in the 1992 BO.

In contrast to adverse impacts on non-target animals from direct take, some species may actually benefit from WS' methods. Coyotes, dogs, and red foxes are opportunistic predators and may feed on many bird and mammal species. Some examples include: coyotes killing fawn and adult white-tailed deer (*Odocoileus virginianus*) which some people enjoy watching, photographing, and legally hunting. Red fox eat eggs and fledglings of quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*), and ruffed grouse (*Bonasa umbellus*) which some people enjoy viewing, feeding, or legally hunting. In contrast, others may argue that coyotes prey on deer which may help reduce the number of deer-vehicle collisions and crop damage in an area.

2.2.4 Effects on Human Health and Safety

A common concern among the public is whether the proposed action or any of the alternatives pose an increased threat to human health and safety. Specifically, there is concern that the lethal methods of predator removal (i.e., chemicals, firearms) may be hazardous to people. A formal risk assessment of WS operational management methods found that risks to human safety were low (USDA 1997a, Appendix P). WS SOP's include measures intended to mitigate or reduce the effects on human health and safety and are presented in Chapter 3.

2.2.4.1 Safety and Efficacy of Chemical Control Methods

Members of the public have expressed concerns that chemical control methods should not be used because of potential adverse effects on people from direct exposure to chemical toxicants or from animals that have died as a result of toxicants. Under the alternatives proposed in this EA, the primary toxicants proposed for use as chemical control methods by WS would be sodium cyanide (M-44) and sodium fluoroacetate (Livestock Protection Collar). A less commonly used toxicant proposed for use by WS would be sodium nitrate (Large Gas Cartridge). Sodium cyanide, sodium fluoroacetate, and sodium nitrate use is regulated by the EPA through FIFRA and by WS Directives.

The use of sodium cyanide, sodium fluoroacetate, and sodium nitrate for mammalian predator damage management poses negligible human risk when used according to directives, policies, laws, and label directions (USDA 1997a, Appendix P). According to the EPA, Poison Control Center, Toxic Exposure Surveillance System for 1993 - 1996, there were over 400,000 recorded

human exposures to all sorts of animal toxicants; however, there were no recorded M-44 human exposures (e-mail from J. Shivik to M. Lowney, USDA, Wildlife Services, Moseley, Virginia, February 17, 1999). M-44's and coyote getters have been used for more than 50 years by WS without any employee fatalities. There was one human fatality from the predicidal use of sodium cyanide by a non-WS employee using a coyote getter (Letter from D. Gretz to WS State Directors, Western Region, November 27, 1989). WS SOP's include measures intended to mitigate or reduce the effects on human health and safety and are presented in Chapter 3. WS personnel who apply pesticides are certified restricted use pesticide applicators and apply pesticides according to label instructions. Each WS employee that use M-44's and LPC's in West Virginia are certificated to use these devices after passing a written test administered by the WVDA.

2.2.4.2 Safety and Efficacy of Non-chemical Control Methods

There may be concern that WS use of firearms, traps, and snares could cause injuries to people. WS personnel may occasionally use rifles and shotguns to remove coyotes, foxes, feral dogs, wolf-hybrids, or exotic carnivores that are preying upon or attempting to prey upon livestock. Handguns may be used to humanely euthanize trapped or snared animals. WS personnel use special restraining traps and snares to humanely capture coyotes, foxes, feral dogs, wolf-hybrids, or exotic carnivores.

Firearm use in wildlife damage management can be a publicly sensitive issue. Safety issues related to the misuse of firearms and the potential human hazards associated with firearms use are concerns both to the public and WS. To ensure safe use, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Additionally, the West Virginia WS program conducts annual firearms training for all personnel.

The use of restraining traps such as foothold traps or snares is a sensitive issue because of the lack of understanding and experience by the public in using these devices. Some people believe they could be captured and restrained by these traps. Some people believe these traps indiscriminately and automatically capture people who may unknowingly approach locations where these traps or snares are set. These concerns are without empirical support; however, to mitigate some of these concerns, WS personnel meet with livestock producers and their adjacent landowners to explain and demonstrate the use of traps and snares to alleviate anxiety some may have. WS also is assisting with the development of Best Management Practices (BMP's) for improving traps and trapping programs in the U.S. These BMP's evaluate the animal welfare and efficiency of various traps for species which can be legally harvested in North America.

2.2.5 Humaneness of Control Methods Used by WS

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important, but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if *" . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

Suffering is described as a *" . . . highly unpleasant emotional response usually associated with pain and distress."* However, suffering *" . . . can occur without pain . . . ,"* and *" . . . pain can occur without suffering . . . "* (AVMA 2000). Because suffering carries with it the implication of a time frame, a case

could be made for *" . . . little or no suffering where death comes immediately . . . "* (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering as pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *" . . . probably be causes for pain in other animals . . . "* (AVMA 2000). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *" . . . neither medical or veterinary curricula explicitly address suffering or its relief"* (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

Animal welfare organizations are concerned that some methods used to manage wildlife damage expose animals to unnecessary pain and suffering. Research suggests that with some methods, such as restraint in foothold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1997a). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

WS is very concerned about animal welfare and where possible, more humane methods are used to capture or kill animals. WS has been funding research to develop Best Management Practices for the use of restraining traps since 1997 and funding trap research for decades (Phillips and Mullis 1996, and Engeman et al. 1997). This would include the use of foothold traps and snares. Traps and snares used by WS embrace many innovations reported in the scientific literature. Coyote size traps must have smooth rounded offset jaws or padded jaws, and pan-tension devices (WS Directive 4.450).

There is concern about captured animals remaining in traps and either chewing their feet or dying. Recent studies have found that coyotes rarely chewed their feet (< 1% of captures) and no animals died in coyote traps from the trap (BMP workshop, unpublished data). To reduce the chance for injury, restraining traps (e.g., foothold traps) and snares are checked daily by WS personnel or by cooperators.

The decision making process involves tradeoffs between managing damage and the aspect of humaneness. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology, yet provide sufficient damage management to resolve problems.

WS has improved the selectivity of management devices through research and development such as pan tension devices for traps and breakaway snares. Research is continuing to bring new findings and products into practical use. Until such time as new findings and products are found to be practical, a certain amount of alleged animal suffering will occur if management objectives are to be met in those situations where non-lethal control methods are not practical or effective.

WS personnel in West Virginia are experienced and professional in their use of management methods. Consequently, control methods are implemented in the most humane manner possible under the constraints of current technology. Mitigation measures and SOP's used to maximize humaneness are listed in Chapter 3.

2.2.6 Effects on the Aesthetic Values of Target and Non-target Species

The human attraction to animals has been well documented throughout history and prompted humans to domesticate animals. The American public shares a similar bond with animals and/or wildlife in general, and today a large percentage of American households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent upon what an observer regards as beautiful.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale, etc.), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing, etc.), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using parts of, or the entire animal) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Some people have an idealistic view of wildlife and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Those directly affected by the problems caused by wildlife usually support removal. Whereas, individuals not directly affected by wildlife damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Wildlife damage management practices are controversial in nature because they may affect each individual differently. WS goals are to assist resources owners in reducing damages while considering all possible non-lethal and lethal methods and employing those methods in a caring, humane, and professional manner. In addition, West Virginia WS would only conduct predator damage management at the request of the affected property owner or resource manager.

2.2.6.1 Effects on Aesthetic Values of Coyote and Red Foxes to the General Public

With the increase in urban sprawl, human encounters with wildlife are becoming more common. Many people enjoy feeding animals and/or otherwise develop emotional attitudes toward wildlife that results in aesthetic enjoyment. In addition, some people consider individual wild animals as "pets," or exhibit affection toward these animals. WS Proposed Action will have minimal effects on animals which provide aesthetic enjoyment to the general public. However, it is possible that WS may occasionally remove a predator that is involved with livestock predation and also provides aesthetic enjoyment. Dispersal of young coyotes or red foxes in the fall and late winter from other areas would likely replace animals removed during a damage management action; thus, providing continued aesthetic enjoyment to the general public.

Similarly, predators located in public areas (e.g., State Park or Wildlife Area) where the general public may enjoy (i.e., viewing, photography, feeding, etc.) the presence of predators, should not be concerned that WS Proposed Actions would have an adverse effect on these predators. It is possible that WS actions may remove predators on a farm in close proximity to a public area if that livestock producer is experiencing predator damage; however, those occurrences are expected to be rare.

2.2.6.2 Effects on Aesthetic Values of Coyotes and Red Foxes to Livestock Owners and Hunters

Livestock and poultry producers who have experienced losses by coyotes or foxes feel these predators have little to no positive value. Some hunters feel coyotes and foxes compete with them for the same game animals they are pursuing. Other landowners who benefit from leasing land to hunters may feel coyotes and foxes are depriving them of monetary gain because coyotes and foxes are eating game animals which hunters would be willing to lease land to hunt. These individuals may feel the environment would be better off if no coyotes and fewer red fox existed in West Virginia. In these instances coyotes and red fox have low or no aesthetic value to these stakeholders.

Predator hunters and trappers may feel that WS actions will compete with them for resources. Although WS may remove coyotes and foxes in areas where hunters or trappers pursue predators, WS actions will typically be on privately owned property during the non-hunting/trapping seasons when pelts are not prime for sale. Instead of competing with hunters and trappers, WS will recommend hunting and trapping to producers as additional predator control methods.

2.3 ISSUES USED TO DEVELOP MITIGATION

2.3.1 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Population"*

Environmental Justice (EJ) is a movement promoting the fair treatment of all races, income, and culture with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. EJ has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. (The EJ movement is also known as Environmental Equity - which is the equal treatment of all individuals, groups or communities regardless of race, ethnicity, or economic status, from environmental hazards).

EJ is a priority both within the USDA/APHIS and WS. Executive Order 12898 requires Federal agencies to make EJ part of their mission, and to identify and address disproportionately high adverse human health and environmental effects of Federal programs, policies, and activities on minority and low-income persons or populations. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. WS developed a strategy that: 1) identifies major programs and areas of emphasis to meet the intent of the Executive Order, 2) minimize any adverse effects on the human health and environment of minorities and low-income persons or populations, and 3) carries out the APHIS mission. To that end, APHIS operates according to the following principles: 1) promote outreach and partnerships with all stakeholders, 2) identify the impacts of APHIS activities on minority and low-income populations, 3) streamline government, 4) improve the day-to-day operations, and 5) foster

nondiscrimination in APHIS programs. In addition, APHIS plans to implement Executive Order 12898 through its compliance with the provisions of NEPA.

All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by WS are regulated by the EPA through FIFRA; by the FDA; the WVDA Pesticide Division; by MOU's with Federal land management agencies, and program directives. Based on a thorough risk assessment, APHIS concluded that when WS program chemicals are used following label directions, they are selective to target individuals or populations and such use has negligible impacts on the environment (USDA 1997a, Appendix P). The WS operational program, discussed in this document, properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority or low-income persons or populations. In contrast, WS activities may actually benefit those with low-income or those whose sole source of income is livestock production. Assistance by WS with predation to livestock may allow those individuals relying on livestock production for income to continue their practices.

2.3.2 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

WS prioritizes the identification and assessment of environmental health and safety risks that may disproportionately affect children. Children may suffer disproportionately from environmental health and safety risks for many reasons, including their physical and mental status. WS has concluded that the proposed management program would not create environmental health or safety risks to children because the program would only make use of legally available and approved damage management methods applied where such methods are highly unlikely to adversely affect children.

2.3.3 National Historic Preservation Act of 1966, as Amended, and The Native American Graves and Repatriation Act of 1990

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires Federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these Federal undertakings. WS actions on tribal lands are only conducted at the tribe’s request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. WS activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. In those cases, the officials responsible for management of such properties would make the request and would have decision-making authority over the methods to be used. WS actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties.

The Native American Graves and Repatriation Act of 1990 provides for protection of American Indian burial sites, human remains, funerary objects and sacred objects, and establishes procedures for notifying Tribes of any new discoveries.

In consideration of American Indian cultural and archeological interests, the West Virginia WS program provided a Notice of Availability (NOA) of this EA to all the tribes in West Virginia. A copy of this EA will be provided to any American Indian tribe in the State of West Virginia that expresses a concern or

interest in the proposed WS action and/or prior to any WS activity proposed to be conducted on tribal lands.

2.4 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.4.1 Legal Constraints on Implementation of Control

WS is required to follow and adhere to all Federal and state regulations. The methods proposed for use in livestock protection/predator damage management are all permitted by Federal and state laws, or the appropriate exemptions/permits will be obtained.

2.4.2 Appropriateness of Preparing an EA (Instead of an EIS) for Such a Large Area

Some individuals might question whether preparing an EA for an area as large as West Virginia would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of Federal or other agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency cleanup organizations, insurance companies, etc. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a predation damage problem has become intolerable to the point that they request assistance from WS. Nor would WS be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and state agencies. Such broad scale population control would also be impractical, if not impossible, to achieve.

If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones.

2.4.3 Cost Effectiveness of Predator Damage Management - Livestock Protection

NEPA does not require preparation of a specific cost-benefit analysis, and consideration of this issue would not be essential to making a reasoned choice among the alternatives being considered. However, cost-effectiveness of WS activities was a common concern among many comments received from other EA's written by other WS offices during the public involvement process and therefore is included in this EA.

Connolly (1981) examined the issue of cost effectiveness of Federal predator damage management programs and concluded that public policy decisions have been made to steer the program away from being as cost effective as possible. This is because of the elimination of damage management methods believed to be effective but less environmentally preferable, such as toxic baits. In addition, the increased costs of implementing the remaining available methods were to achieve other public benefits besides livestock protection and could be viewed as mitigation for the loss of effectiveness in reducing damage. USDA (1997a) stated that "Cost effectiveness is not, nor should it be, the primary goal of the WS program." Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received (USDA 1997a). These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are considered a vital part of the WS program.

A cost-benefit analysis is usually limited to quantifiable values and does not consider a number of values that would be difficult to measure. When sheep are repeatedly harassed by predators, for example, they become extremely alarmed and weary and do not disperse and feed normally. Therefore, they would not find the quality and quantity of feed that they would have if unstressed, resulting in lower lamb weights at the end of the grazing season. This is a form of predator damage, but it would be difficult to quantify. Jahnke et al. (1988) and Wagner (1988) discussed additional examples of indirect predator damage, including increased labor costs and producer efforts to find sheep scattered by predators and range damage related to the tighter herding required in response to the presence of predators.

Cost-effectiveness of WS predator damage management can be assessed by looking at the difference between: 1) the value of actual losses with the program in place, plus the cost of the program, and 2) the value of what losses could reasonably be expected without the program in place. USDA (1997a) cites four studies where sheep losses to predators were documented with no damage management program in place (Table 2.4). Annual predation loss rates during these studies varied from 6.3-29.3% for lambs and 0 to 20.8% for adult sheep. The average rate of loss to predators was about 7% for sheep and 17% for lambs. It is reasonable to assume losses without damage management in place could be similar to those found in the studies examined in Table 2.4 in areas with historic coyote predation.

Table 2.4. Annual predation loss rates for sheep and lambs in 5 studies in the United States.

Source	Location	Year	Annual loss rates	
			Sheep	Lambs
Henne (1977)	Montana	1974/1975	20.8%	29.3%
Munoz (1977)	Montana	1975/1976	16%	24.4%
McAdoo and Klebenow (1978)	California	1976	N/A	6.3%
Delorenza and Howard (1976)	New Mexico	1975	0%	12.1%
Delorenza and Howard (1976)	New Mexico	1976	0%	15.6%

The WS program has conducted a predator damage management program State of West Virginia since 1996. In the spring of 1996 the West Virginia Integrated Predation Management Program (IPMP) was initiated in 3 eastern West Virginia counties. West Virginia WS responded to 40 sheep producers reporting coyote predation. Sheep losses reported by each of these farmers averaged 27.8 head per farm. (Unpublished MIS data). Through the application of IWDM practices WS was able to reduce predation levels in 1996 to an average of 2.53 head of sheep per farm lost to coyotes. The 1996 predation rate of 2.53 head per farm represents a 91% reduction in predation by coyotes over the 1995 sheep losses. Since 1996 WS cooperators have averaged only 3.6 head of livestock lost to all types of predation.

2.4.4 Effects on Legal Hunting and Trapping

Some people may be concerned that WS-conducted predator management activities would affect regulated hunting and trapping by reducing local wild canid populations and that lethal and non-lethal damage management methods may interfere with legal regulated hunting and trapping.

WS annual take of coyotes and fox by lethal control methods would be very minimal compared to the annual take by licensed hunters in West Virginia (See Section 4.1.1). WS activities may result in reduced

coyote or fox densities on project area properties and on adjacent properties, hence slightly reducing the number of coyotes and fox that may otherwise be available to local licensed hunters. Coyote and fox densities on other properties outside the project area would likely not be effected, thus providing ample opportunities for hunters and trappers to harvest these animals.

2.4.5 Lethal Methods may Increase Predation and the Coyote Population through Compensatory Reproduction

Mortality in coyote populations can range from 19%-100%, with 40%-60% mortality most common (USDI 1979). Several studies of coyote survival rates, which include calculations based on the age distribution of coyote populations, show typical annual survival rates of only 45% to 65% for adult coyotes. High mortality rates have also been shown in four telemetry studies involving 437 coyotes that were older than 5 months of age; 47% of the marked animals are known to have died (USDI 1979). Mortality rates of "unexploited" coyote populations were reported to be between 38%-56%. Thus, most natural coyote populations are not stable (USDI 1979). In studies where reported coyote mortality was investigated, only 14 of 326 recorded mortalities were due to WS activities (USDI 1979).

Dispersal of "surplus" young coyotes is the main factor that keeps coyote populations distributed throughout their habitat (Knowlton 1972, Harrison et al. 1991, Harrison 1992). Such dispersal of subdominant animals removes surplus animals from higher density areas and repopulates areas where artificial reductions have occurred. Studies (Connolly et al. 1976, Gese and Grothe 1995, Gese 1999) which investigated the predatory behavior of coyotes, determined that the more dominant (alpha) animals (adult breeding pairs) were the ones that initiated and killed most of the prey items. Thus, it appears the above concern is unfounded because the removal of local territorial (dominant, breeding adult) coyotes actually removes the individuals that are most likely to kill livestock and generally results in the immigration of subdominant coyotes that are less likely to prey on livestock.

Coyotes in areas of lower population densities may reproduce at an earlier age and have more offspring per litter; however, these same populations generally sustain higher mortality rates (Connolly and Longhurst 1975). Therefore, the overall population of the area does not change. The number of breeding coyotes does not substantially increase without exploitation and individual coyote territories produce one litter per year independent of the population being exploited or unexploited (Connolly and Longhurst 1975). Connolly and Longhurst (1975) demonstrated that coyote populations in exploited and unexploited populations do not increase at significantly different rates and that an area will only support a population to its carrying capacity.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992) as described in Chapter 2 (pages 20-35), Appendix J (Methods of Control), Appendix N (Examples of WS Decision Model), and Appendix P (Risk Assessment of Wildlife Damage Control Methods Used by USDA, Wildlife Services Program) of the ADC FEIS (USDA 1997a).

Chapter 3 of this EA contains a discussion of the project alternatives, including those that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), alternatives considered but not analyzed in detail, with rationale, and mitigation measures and SOP's for wildlife damage management techniques. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Evaluation of the affected environments will be addressed in more detail in Chapter 4.

ALTERNATIVES ANALYZED IN DETAIL

Alternative 1 - Technical Assistance Only - This alternative precludes any and all IWDM direct control activities by WS to protect livestock from predation in West Virginia. Producers or any other entity directed at preventing or reducing predation of livestock could conduct IWDM direct control activities in the absence of WS involvement. However, if requested, affected producers would be provided with technical assistance information only.

Alternative 2 - Non-lethal Control Only - This alternative would involve the use and recommendation of non-lethal management techniques only by WS.

Alternative 3 - Non-lethal Control before Lethal Control - This alternative would not allow the use or recommendation of lethal control by WS until all available non-lethal methods had been applied and determined to be inadequate in each damage situation.

Alternative 4 - Lethal Control Only - This alternative would involve the use and recommendation of lethal management techniques only by WS.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action) - This alternative would continue the current IWDM using components of the wildlife damage management techniques and methods addressed in Alternatives 1-4 as deemed appropriate by WS and other participating entities.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia - This alternative would result in no assistance from WS in reducing predator damage to livestock in West Virginia. WS would not provide technical assistance or operational damage management services.

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1 - Technical Assistance Only

This alternative precludes any and all IWDM direct control activities by WS to protect livestock from predation in West Virginia. Producers or any other entity directed at preventing or reducing predation of livestock could conduct IWDM direct control activities in the absence of WS involvement. However, if requested, affected producers would be provided with technical assistance information only.

3.1.2 Alternative 2 - Non-lethal Control Only

Under this alternative, only non-lethal direct control activities and recommendations would be provided by WS to resolve coyote, fox, feral dog, wolf-hybrid, or exotic carnivore predation on livestock. Requests for information regarding lethal management approaches would be referred to WVDNR, local animal control agencies, or private businesses or organizations. Individuals or agencies might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, use volunteer services of private organizations, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary.

Non-lethal control methods include, but are not limited to, fencing, shed birthing, guard animals (i.e., dogs, llamas, and donkeys), harassment, and shepherds. These are discussed in detail in Appendix B.

Persons receiving non-lethal assistance could still resort to lethal methods, but not with WS assistance. Lethal control methods which could be implemented by the public include: shooting, calling and shooting, snares, and trapping. M-44's and Livestock Protection Collars are registered in the state of West Virginia for use by WS employees only. Therefore, use of these chemicals by private individuals and state and local government agency personnel would be illegal.

3.1.3 Alternative 3 - Non-lethal Control before Lethal Control

This alternative would require that all methods or techniques described in 3.1.2 be applied and determined to be inadequate in each damage situation prior to the implementation of any of the methods or techniques described in 3.1.4. This would be the case regardless of the severity or intensity of predation on livestock.

3.1.4 Alternative 4 - Lethal Control Only

This alternative would allow only lethal removal of coyotes, foxes, feral dogs, wolf-hybrids, and exotic carnivores causing predation on livestock and would not require use of or consideration of non-lethal methods. Lethal control methods would be applied in all areas of control operations. Coyotes and foxes caught in traps or snares would be euthanized on site in a humane manner utilizing American Veterinary Medical Association (AVMA) approved methods and WS SOP's. Euthanization would occur by either injection with a WS approved drug or shooting. Deceased animals would be disposed of in accordance with WS policy and State Regulations. Unharmed and uninjured non-target animals that can be safely handled, would be released on site.

Lethal methods of wildlife control are often very effective when used properly. Specific problem animals can be targeted and removed without negatively affecting the local population of a species (Bailey 1984). All control measures would be implemented in accordance with applicable Federal, state, and local laws, and WS policy. Weather and environmental conditions permitting, traps and snares would be checked at least once each day. If daily checking is not possible, this equipment would be removed from the site. M-44's and LPC's would be checked according to label specifications. Local population reduction of coyotes and foxes to reduce immediate predation losses and potential predation threats may be implemented by WS personnel with assistance from the participating land managers. Target individuals would be lethally removed using the methods and techniques listed in Appendix B.

Technical assistance would still be provided to livestock producers to allow them to take predators by lethal methods. Requests for information regarding non-lethal management approaches would be referred to WVDNR, local animal control agencies, or private businesses or organizations. Individuals or agencies might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, use volunteer services of private organizations, or take no action. In some cases, control methods employed by others could be contrary to the intended use or in excess of what is necessary. Not

all of the methods listed in Appendix B as potentially available to WS would be legally available to all other agencies or individuals (e.g., M-44's and LPC's).

3.1.5 Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

This alternative, the proposed action, would continue IWDM utilizing any legal techniques and methods, used singly or in combination, described in Alternatives 1-4 to meet requester needs for resolving predation on livestock and conflicts with coyotes, foxes, feral dogs, wolf-hybrids, and exotic carnivores (Appendix B). The proposed action is to continue the current integrated wildlife damage management program assisting livestock producers with reducing losses of sheep, cattle, goats, pigs, poultry, and other livestock to predators in the State of West Virginia. Cooperators requesting assistance are provided with information regarding the use of effective non-lethal and lethal techniques. Most non-lethal methods are best implemented by the livestock producer and the following methods may be recommended by WS: guard dogs, llamas, and donkeys; Electronic Predator Guard (Linhart et al. 1992); fencing; moving livestock to other pastures; birthing in buildings; night penning; habitat alteration; herders and scare devices. Additional methods used by WS, or recommended to producers include shooting, calling and shooting, trapping, snares, dogs, M-44's, Livestock Protection Collars, and gas cartridges. All management actions comply with appropriate Federal, state, and local laws.

3.1.6 Alternative 6 - No Federal WS Predator Damage Management in West Virginia

This alternative would result in no assistance from WS to reduce predator damage to livestock in West Virginia. WS would not provide technical assistance or operational damage management services. All requests for predator damage management would be referred to the WVDNR, local animal control agencies, or private businesses or organizations. Assistance may or may not be available from any of these entities.

3.2 STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN WEST VIRGINIA

The strategies and methodologies described below include those that could be used or recommended under the Alternatives 1, 2, 3, 4 and 5 described above, Alternative 6 would eliminate any assistance by WS. Alternative 1 would not allow WS to conduct direct control activities. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. Knowlton et al. (1999) states that "Various techniques can prevent or curtail predation on livestock but none are universally effective", "...removing coyotes to solve depredation problems is typically more effectively done by wildlife management personnel", and that "successful depredation management requires a variety of techniques used in an integrated program." The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., harassment), removal of individual offending animals, local population reduction, or any combination of these and other effective methods, depending on the circumstances of the specific damage problem. WS considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requester, WS, or other agency personnel, as appropriate. Two strategies are available:

3.2.1.1 Preventive Damage Management

Preventive damage management is applying wildlife damage management strategies before damage occurs, based on historical problems and data. All non-lethal methodologies, whether applied by WS or resource owners, are employed to prevent damage from occurring, and therefore, fall under this heading. When requested, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. For example, in areas where lamb or calf depredations have occurred historically, WS may provide information about livestock guarding animals, fencing or other husbandry techniques, or if requested, conduct coyote damage management before lambing or calving begins.

The rationale for conducting preventive damage management to reduce damage differs little in the accepted management principle of holding controlled hunts for deer or elk in areas where agricultural damage has been a historical problem. By reducing the number of deer near agricultural fields, or the number of coyotes near a herd of sheep, the likelihood of damage is reduced.

Shelton and Klindt (1974) documented a strong correlation between coyote densities and levels of sheep loss in Texas, and Robel et al. (1981) found a similar correlation in Kansas. In southeastern Idaho, Stoddart and Griffiths (1986) documented an increase in lamb losses followed by a decrease in lamb losses as coyote populations rose and fell, respectively. Gantz (1990) concluded that late winter removal of territorial coyotes from mountain grazing allotments would reduce predation on sheep grazing on those allotments the following summer.

Blejwas et al. (In Press) and Sacks et al. (1999a, 1999b) found that breeding adults whose territories contained sheep were typically responsible for the killing of livestock and that targeting those individuals for removal reduced predation to livestock. Wagner and Conover (1999) found that preventative damage management in areas of historic predation on livestock significantly reduced predation to livestock and was cost effective. Conner et al. (1998) suggested that coyote removal efforts should occur just prior to known peaks of predation.

3.2.1.2 Corrective Damage Management

Corrective damage management is applying wildlife damage management to stop or reduce current losses. As requested and appropriate, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. For example, in areas where verified and documented livestock depredations are occurring, WS may provide information about livestock guarding animals, fencing or husbandry techniques, or conduct operational damage management to stop the losses. The U.S. General Accounting Office (GAO) concluded that, according to available research, localized lethal damage management is effective in reducing coyote damage (GAO 1990).

3.2.2 The IWDM Strategies that WS Employs in West Virginia

3.2.2.1 Technical Assistance Recommendations (implementation is the responsibility of the requester)

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. Technical assistance may require substantial effort by WS personnel in the decision making process, but the implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester

for short and long-term solutions to damage problems, these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS' NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving livestock damage problems.

3.2.2.2 Direct Control Damage Management Assistance (assistance conducted or supervised by WS personnel)

Direct control damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, or to make technical assistance methods more effective, and when *Agreements for Control* or other comparable instruments provide for WS direct control damage management. The initial investigation defines the nature, history, extent of the problem, species or property directly and indirectly damaged, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex.

3.2.2.3 Educational Efforts in West Virginia

Education is an important element of WS program activities because wildlife damage management is about finding "balance" or coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to producers, homeowners, state and county agents, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are periodically updated on recent developments in damage management technology, laws and regulations, and agency policies.

WS provides informational leaflets about identifying predation damage, biology and ecology of the predator(s) involved, specific methods and products most effective in reducing losses, and sources for supplies/products.

3.2.3 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3.1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a documented process, but a mental problem-solving process common to most if not all professions.

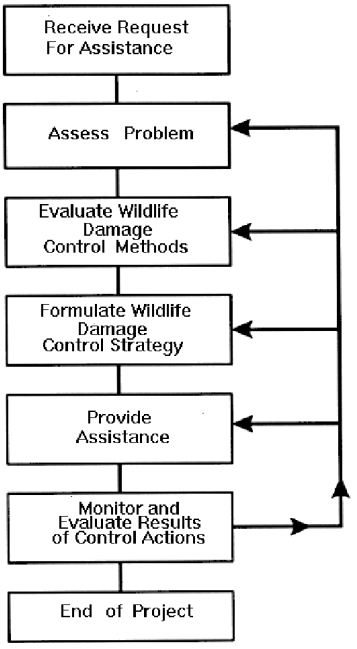

Figure 3.1 Wildlife Services Decision Model Process

3.2.4 Decision Making by Livestock Producers

The WS program in West Virginia follows the "Co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of coyotes, foxes, feral dogs, wolf-hybrids, and exotic carnivores and effective, practical, and reasonable methods available to the producers to reduce predation on livestock. This includes non-lethal and lethal methods. Some technical assistance on alleviating damage caused by predators is available from the WVDNR, WVDA, County Extension Agents, County Soil and Water Conservation Districts, county animal control, and private nuisance wildlife control agents. WS and other state and Federal wildlife or wildlife damage management agencies may facilitate discussions at local

community meetings when resources are available. Livestock producers directly affected by predation have direct input into the resolution of such problems. Producers may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Livestock producers decide which effective methods should be used to solve a livestock predation problem on their farm. These livestock producer decision makers include private property owners/managers, and public property managers.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.3.1 Compensation for Wildlife Damage Losses

The [redacted] does not currently reimburses livestock producers for losses due to coyote predation though it has been proposed. Reimbursement provides producers monetary compensation for losses, it does not remove the problem nor does it assist with reducing future losses from predation. Analysis of this alternative in USDA (1997a) shows that it has many drawbacks:

- Compensation would not be practical for public health and safety problems.
- It would require larger expenditures of money to investigate and validate all losses, and to determine and administer appropriate compensation.
- Timely responses to all requests to assess and confirm losses would be difficult, and many losses may not be verified.
- Compensation would give little incentive to limit losses through other management strategies.
- Not all resource managers/owners would rely completely on a compensation program and unregulated lethal control would probably continue and escalate.

Regardless of the predator, compensation for losses does not resolve the initial problem of predation for producers and losses continue.

3.3.2 Coyote Bounties

During the early years of game management, many states relied on massive killing efforts (bounties) to reduce predator numbers (e.g., wolves, coyotes, foxes) which were competing with man for game animals (e.g., white-tailed deer). Bounties are not used by most wildlife agencies nor are they supported by WS for predator control because:

- Bounties are not effective in reducing damage.
- Circumstances surrounding take of animals is largely unregulated.
- No process exists to prohibit taking of animals from outside the damage management area for compensation purposes.
- Bounty hunters may mistake dogs and foxes as coyotes.
- Officials responsible for checking in coyotes may mistake dogs and foxes as coyotes.
- Coyote bounties have a long history (>100 years in the U.S.) of use in many states without ever achieving the intended results of reducing damage and population levels (Parker 1995).

The overwhelming disadvantage of coyote bounties is the misdirection of funds meant to, but not effectively and economically able to, reduce coyote damage to livestock.

3.3.3 Fertility Control of Predator Populations

Fertility control of predator populations may include surgical sterilization (vasectomies or tubal ligations), endocrine regulation (steroids, GnRH [gonadotropine-releasing hormone], antiprogestins), and immunocontraception. Endocrine regulation agents are designed to control hormone levels and regulate fertility in vertebrate species. Immunocontraception uses an individual's own immune system to disrupt reproduction. Although these fertility control methods have shown promise, they can be costly and with the exception of sterilization, need to be administered (boosted) regularly to maintain effectiveness. Many hurdles must be overcome before fertility control becomes a viable wildlife management control alternative. These include, but are not limited to, the development of contraceptive agents that are orally deliverable, species specific, reversible, have few side-effects, and are cost effective (Sanborn et al. 1994).

Fertility control is still in the developmental stages and the full effects on wildlife populations and cost effectiveness is being evaluated. The National Wildlife Research Center (NWRC) (the research branch of the WS program) is evaluating the effects of fertility control on coyote populations. Preliminary findings indicate that surgically sterilized coyotes maintain pair bonds, defend territories, and kill significantly

fewer sheep than unsterilized coyotes. Furthermore, coyotes given multiple porcine zona pellucida (PZP, an immunosterilant) injections are immunologically sterilized and continue to maintain pair-bonds and successfully defend territories in pen tests. These results are promising; however, immunosterilization was not permanent and could break down, allowing previously sterile females to produce offspring. In addition, the effectiveness of surgical sterilization was only cost efficient when it involved 1-3 packs of coyotes.

Although there may be some applications for fertility control, use of these methods to protect livestock throughout the State of West Virginia would not be cost effective or practical at this time and is prohibited by state law (WVCSR §20-2-5d). Fertility control also may effect the genetics of a population over a large area. Because these management techniques are still in the preliminary stages and researchers do not fully understand the effects on wildlife populations, considering fertility control to reduce predation on West Virginia's livestock would be precipitous and premature. Before the use of fertility control could be used on predator populations in the State of West Virginia, the WVDNR would need to be consulted and would decide if these methods could be used for population control. The West Virginia WS program will keep updated on new findings with regards to fertility control use on predator populations and will consider use of these methods if they become feasible for controlling predation on livestock in West Virginia.

3.3.4 Corrective Predator Damage Management Only, No Preventative Damage Management

Some people believe lethal management actions should be implemented to stop predation on livestock only after predation has started. These people oppose preventative lethal management actions which may involve removal of coyotes living near livestock operations even though these same livestock operations have chronic historic predation.

Gantz (1990) concluded that late winter removal of territorial coyotes from mountain grazing allotments would reduce predation on sheep grazing on those allotments the following summer. Blejwas et al. (2002) and Sacks et al. (1999a, 1999b) found that breeding adults whose territories contained sheep were typically responsible for the killing of livestock and that targeting those individuals for removal reduced predation to livestock. Conner et al. (1998) suggested that coyote removal efforts should occur just prior to known peaks of predation.

While WS is unable to predict which predator will kill livestock or which livestock operations will have substantial predator losses, WS can look at historical records for each farm and draw inferences. On livestock operations with historic predator losses, it is likely there will be future losses. Therefore, it is prudent for the livestock manager to have predators removed as good husbandry, especially prior to lambing, kidding, or calving. WS is able to better serve the livestock industry when requests for assistance are more evenly distributed rather than being overwhelmed with requests for service, especially during spring lambing, kidding, and calving.

3.3.5 Require Livestock Producers to Help Themselves before Receiving Assistance from WS

Although no law or policy requires livestock producers to employ husbandry or other predator prevention practices to protect their livestock, 39% of cattle and 83% of sheep producers in the U.S. report using non-lethal methods to help themselves (NASS 1999). In 1998, cattle and sheep producers in the U.S. spent $3.2 and $4.1 million on non-lethal management methods, respectively (NASS 1999).

Livestock producers in the U.S. employ many lethal and non-lethal management methods to reduce predator losses. The most frequently used non-lethal methods include: guard animals, fencing, shed birthing, herding, night penning, and frightening tactics (NASS 1999). WS policy is to respond to all requests for assistance within program authority, responsibility, and budget. If improved husbandry and

other non-lethal methods would reduce predation on livestock, then WS will recommend these practices following the IWDM approach.

3.3.6 No Use of Chemical Methods

Much of the public's concern over the use of registered toxicants for predator damage management is based on an erroneous perception that WS uses non-selective, outdated chemical methodologies. In reality, the chemical methods currently used by WS have a high degree of selectivity (see section 4.1.4). WS use of registered toxicants is regulated by the EPA through the FIFRA, by MOU's with other agencies, and by program directives. In addition, APHIS conducted a thorough risk assessment and concluded that chemicals used according to label directions are selective for target individuals or populations, and therefore, have negligible impacts on the environment (USDA 1997a, Appendix P).

The decision to use registered toxicants falls within the WS Decision Model (see section 3.2.3) (Slate et al. 1992). Chemical methods are used because they allow for efficient and effective delivery of service to more livestock producers than would be served if registered toxicants were unavailable. Most registered toxicants have the ability to work during inclement weather and solve predation problems, whereas, traps and snares may be inoperable and shooting impractical in the same inclement weather.

3.3.7 Relocation of Coyotes and Foxes Killing Livestock

Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988).

3.4 MITIGATION AND SOP'S FOR LIVESTOCK DAMAGE MANAGEMENT TECHNIQUES

3.4.1 Mitigation Measures

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in West Virginia, use many such mitigation measures and these are discussed in detail in Chapter 5 of the ADC FEIS (USDA 1997a).

Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS SOP's include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, would be consistently used.
- Reasonable and prudent alternatives and measures would be established through consultation with the USFWS and would be implemented to avoid adverse impacts to T&E species.
- EPA-approved label directions would be followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse impacts to the environment when chemicals are used in accordance with label directions.
- All WS employees in the state of West Virginia who use "Restricted Use Pesticides" are trained and certified as Public Applicators by the WVDA Pesticide Division.
- Non-target animals captured in traps or snares are released unless it is determined by a WS employee that the animal would not survive and/or that the animal cannot be released safely.

- Conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and chemical control agents are placed at major access points to areas where WS is be conducting active predator management operations.

- Research is being conducted to improve management methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate non-target hazards and environmental impacts.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

3.4.2 Additional Mitigation Measures and SOP's for Wildlife Damage Management Techniques

Some additional mitigating factors specific to the current program include the following:

- Generalized population suppression across the State, or even across major portions of the state, would not be conducted.

- WS uses control devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997a, Appendix P). Additionally, because most of WS activities are conducted on private lands or other lands of restricted public access, the risk of hazard to the public and their pets would be even further reduced.

3.5 ADDITIONAL MITIGATION MEASURES SPECIFIC TO THE ISSUES

The following is a summary of additional mitigation measures that are specific to the issues listed in Chapter 2 of this document.

3.5.1 Effects on Target (Coyote and Red Fox) Species Populations

- WS activities conducted to resolve predation on livestock are directed towards individual problem animals, or local populations or groups, and not towards the eradication of a species or population within an entire area, region, or ecosystem.

- WS lethal take (kill) data is regularly monitored by WS biologists and is compliant with the recommended or authorized levels of harvest allowed by the State of West Virginia (See Chapter 4).

3.5.2 Effects on Dogs, Wolf-hybrids, and Exotic Carnivores

- M-44's are not be set from November 1 thru December 31 to avoid exposure to hunting dogs and sportsman. M-44's are set within fenced areas where non-target dogs are likely to be excluded. In addition, warning signs are placed at the main entry points of farms and within 25 feet of each M-44 to notify dog owners of this hazard.

- Livestock owners are required to notify neighbors with dogs, wolf-hybrids, and exotic carnivores that M-44's have been placed within fenced areas and their pets should be restrained from roaming at large.

- Livestock producers are instructed to notify hunters requesting and receiving permission to hunt that LPC's, snares, traps, and other control methods are in place on the farm.

- Dogs, wolf-hybrids, and exotic carnivores would be returned to the owner if the animals wear identification and are known not to be the offending predator.

3.5.3 Effects on Non-target Wildlife Populations, Including T&E Species

- The WS Decision Model (Slate et al. 1992) was designed to identify the most appropriate damage management strategies and their impacts and would be used to minimize impacts on non-target wildlife and avoid impacts on T&E species.

- WS has consulted with the USFWS regarding the nationwide and West Virginia programs and would continue to implement all applicable measures identified by the USFWS to ensure protection of T&E species.

- The WVDNR was a cooperating agency in the development of this EA, and was consulted to mitigate impacts to T&E species.

- WS activities conducted to resolve livestock predation and damage would be directed towards individual problem animals, or local populations or groups, and not towards the eradication of a species or population within an entire area, region, or ecosystem.

- Animals taken by WS would be considered with the statewide total harvest when estimating the impact on native wildlife species. These data would be used to maintain a magnitude of harvest below the level that would affect the viability of a native population.

- When conducting removal operations via shooting, WS would shoot only target species or animals and would not shoot an animal that can not be accurately identified.

- WS employees would use lures, trap placements (sets), and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

- No traps would be set within 50 feet of an exposed carcass to preclude capture of eagles and other birds.

- Traps would be selected so foot injuries to captured animals are kept to a minimum (e.g., laminated, offset, or padded jaws; swivels, shock springs, etc.) and would incorporate pan tension devices to avoid capture of non-target species.

- Traps and snares would be checked on a 24-hour basis and would not be placed in areas or trails habitually used by deer or other non-target animals, unless measures are taken to avoid those non-target animals (e.g., jump stick for deer).

- Current regulations require a deer stop (prevents the snare from closing to no more than 2 ½ inches in diameter) or break away device (breaks open at 350 pounds or less) on all snares used in West Virginia.

- The use of traps and snares would conform to current laws and regulations administered by the WVDNR and WS policy.

- Healthy, uninjured non-target animals captured in traps or snares would be released.

- Injured non-target animals will be treated by a rehabilitator or veterinarian or euthanized, depending on the extent of injury.

- M-44's and LPC's are placed within fenced areas where livestock graze to target offending predators and to reduce exposure to non-target wildlife.

3.5.4 Effects on Human Health and Safety

- The WS Decision Model (Slate et al. 1992) was designed to identify the most appropriate damage management strategies and their impacts and would be used to capture the target species and minimize impacts on human health and safety.

- WS control operations would be conducted professionally and in the safest manner possible. Most trapping and snaring would be conducted away from areas of high human activity and signs are placed to warn the public of any potential hazards.

- All pesticides used by WS are registered with EPA and WVDA. EPA label directions are followed by WS for all pesticides used in West Virginia.

- All WS certified pesticide applicators who use "Restricted-Use Pesticides" participate in WVDA approved continuing education to keep informed of developments and maintain their certifications.

- All WS employees using M-44's are required to carry antidote kits at all times, wear leather gloves and safety glasses, and pass a written test prior to receiving certification to use M-44's.

- All LPC applicators are required to wear waterproof gloves when handling collared sheep or goats and pass a written test prior to receiving certification to use LPC's.

- Warning signs indicating the placement of traps, snares, M-44's, or LPC's on a farm are placed at the main entry points.

- WS predator management via shooting is conducted professionally and in the safest manner possible. Shooting is conducted during time periods when public activity and access to the control areas are restricted. WS personnel involved in shooting operations are fully trained in the proper and safe application of this method.

- All WS employees using firearms receive firearms training at least every 3 years.

3.5.5 Humaneness of Control Methods Used by WS

- WS employees are well trained in the latest and most humane devices/methods for removing problem wildlife.

- WS personnel attempt to dispatch captured target animals as quickly and humanely as possible. In most field situations, a precise shot to the brain using a small caliber firearm would be performed. This method causes rapid unconsciousness followed by the cessation of heart and respirator functions, resulting in a humane and rapid death. This method is in concert with the AVMA definition of euthanasia (AVMA 2000).

- The NWRC is continually conducting research, with the goal, to improve the selectivity and humaneness of wildlife damage management devices used by WS personnel in the field.

3.5.6 Effects on the Aesthetic Values of Target and Non-target Species

- Dead animals are kept from public view when placed in government vehicles traveling on public roads. In addition, dead animals are not disposed of in locations where the public is likely to see the animals.

- WS employees avoid euthanizing animals when the public is present.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions on the livestock protection/predator damage management objectives outlined in Chapter 1 and the issues and affected environment discussed in Chapter 2. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 3. This chapter analyzes the environmental consequences of each alternative in comparison with the No Action Alternative to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the proposed WS Predator Damage Management Alternative (Alternative 5) serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration WS mandates, directives, and the procedures used in the WS decision process (USDA 1997a).

The following resource values within the State of West Virginia are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, critical habitats (areas listed in T&E species recovery plans), air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Impacts: Discussed in relationship to each of the potentially affected species analyzed in this chapter.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Impacts on sites or resources protected under the NHPA: WS actions are not undertakings that could adversely affect historic resources (See Section 2.3.3).

ALTERNATIVES ANALYZED IN DETAIL

Alternative 1 - Technical Assistance Only - This alternative precludes any and all IWDM direct control activities by WS to protect livestock from predation in West Virginia. Producers or any other entity directed at preventing or reducing predation of livestock could conduct IWDM direct control activities in the absence of WS involvement. However, if requested, affected producers would be provided with technical assistance information only.

Alternative 2 - Non-lethal Control Only - This alternative would involve the use and recommendation of non-lethal management techniques only by WS.

Alternative 3 - Non-lethal Control before Lethal Control - This alternative would not allow the use or recommendation of lethal control by WS until all available non-lethal methods had been applied and determined to be inadequate in each damage situation.

Alternative 4 - Lethal Control Only - This alternative would involve only the use and recommendation of lethal management techniques by WS.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action) - This alternative would incorporate an integrated approach to wildlife damage management using components of the wildlife damage management techniques and methods addressed in Alternatives 2-4 as deemed appropriate by WS and other participating entities.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia - This alternative would result in no assistance from WS in reducing predator damage to livestock in West Virginia. WS would not provide technical assistance or operational damage management services.

4.1 DETAILED ANALYSIS OF ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

4.1.1 Effects on Target (Coyote and Red Fox) Species Populations

The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997a). Magnitude is described in USDA (1997a) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS would only conduct damage management on species where population densities are considered high and only after they have caused damage.

Ecology of Coyotes

Prior to 1900, the distribution of the coyote was mainly limited to the short grass prairie region of the western United States (Parker 1995). Two separate colonization events occurred on a northern and southern front as coyotes expanded their range into the eastern United States (Parker 1995 and Moore and Parker 1992). The northern front began at the turn of the century as wolves were extirpated and habitat changes (i.e. clearing of forests) left a niche that was later filled by coyotes (Parker 1995). On the southern front, the main thrust of the expanding coyote population did not cross the Mississippi River basin until the 1960's (Parker 1995). The extirpation of the red wolf and the loss of forest habitat in the south was also favorable for coyotes (Parker 1995). Coyotes first entered West Virginia in the late 1970's and are now found in every county in the state (J.Evans, WVDNR, Pers. Comm., Warner et al. 2001).

Coyote pelage typically are distinguished by four color phases which range from dark brown to blond or reddish-blond, but the most common (typical) is an overall gray-brown, with tan legs, rufus flanks, rich rufus ears, and grizzled gray frontals (Hilton 1978). While melanism has been considered a diagnostic feature useful for determining red wolves from coyotes (Parker 1995), Gipson (1978) suggests melanistic coyotes are the result of hybridization among coyotes and red wolves. Eastern coyotes are generally larger than their western counterparts. Hilton (1978) reported that the average weight of coyotes throughout the east is less than 40 pounds.

Food habits of eastern coyotes include white-tailed deer, rabbits and rodents, fruits and berries, livestock, birds, and carrion. The white-tailed deer may provide up to 60% of a coyotes diet from January through April and up to 70% in June and July when fawns are especially susceptible (Witmer et al. 1995, Lavigne 1995, Blanton and Hill 1989).

Coyotes breed in late-January through February. After a 63 day gestation cycle, an average of 5 to 7 pups are born (Chambers 1992). Both adults feed the pups with the possibility of unmated coyotes living in the group contributing as well (Snow 1967). The pups usually stay with the adults through the fall and may disperse before the next breeding cycle in February. Eighty-seven percent of the juveniles will disperse after 12 months and all by 19 months (Lorenz 1978). Radio-marked juveniles dispersed from October through January for distances of 10-42 miles with an average of 30 miles (Berg and Chesness 1978).

The cost to accurately determine absolute coyote densities over large areas would be prohibitive (Connolly 1992) and would not appear to be warranted for this EA given the coyote's relative abundance. Because determinations of absolute coyote densities are frequently limited to educated guesses (Knowlton 1972), many researchers have estimated coyote populations throughout the west and east (Pyrah 1984, Camenzind 1978, Knowlton 1972, Clark 1972, USDI

1979). The presence of unusual food concentrations and non-breeding helpers at the den can influence coyote densities and complicate efforts to estimate abundance (Danner and Smith 1980). Coyote densities range from 0.2/mi^2 when populations are low (pre-whelping) to 3.6/mi^2 when populations are high (post-whelping) (USDI 1979, Knowlton 1972). Knowlton (1972) concluded that coyote densities may approach a high of 5-6/mi^2 under extremely favorable conditions with densities of 0.5 to 1.0/mi^2 possible throughout much of their range.

The literature on coyote spatial organization is confusing (Windberg and Knowlton 1988, Messier and Barrette 1982). Coyotes are highly mobile animals with home ranges that vary by sex, age of the animal, and season of the year (Pyrah 1984, Althoff 1978, Todd and Keith 1976). Coyote home ranges may vary from 2.0 to 21.3 mi^2 (Andelt and Gipson 1979, Lovell 1996). Ozoga and Harger (1966), Edwards (1975), and Danner (1976) observed overlap between coyote home ranges and did not consider coyotes to be territorial. Other studies have shown that coyotes occupy territories and that each territory may have several non-breeding helpers at the den during whelping (Allen et al. 1987, Bekoff and Wells 1982). Therefore, each coyote territory may support more than just a pair of coyotes. Gese et al. (1988) reported that coyote groups of 2, 3, 4, and 5 comprised 40%, 37%, 10% and 6% of the resident population, respectively, and Messier and Barrette (1982) reported that during November through April, 35% of the coyotes were in groups of 3 to 5 animals.

The unique resilience of the coyote, its ability to adapt, and its perseverance under adverse conditions is commonly recognized among biologists and land managers. Despite intensive historical damage management efforts in livestock production areas and despite sport hunting and trapping for fur, coyotes continue to thrive and expand their range, occurring widely across North and Central America (Miller 1995). Connolly and Longhurst (1975) determined that, *"if 75% of the coyotes are killed each year, the population would be exterminated in slightly over 50 years."* However, the authors go on to explain that their *"model suggests that coyotes, through compensatory reproduction, can withstand an annual population mortality of 70%"* and that coyote populations would regain pre-control densities (through recruitment, reproduction and migration) by the end of the fifth year after control was terminated even though 75% mortality had occurred for 20 years. In addition, other researchers (Windberg and Knowlton 1988) recognized that immigration, (not considered in the Connolly and Longhurst (1975) model) can result in rapid occupancy of vacant territories, which helps to explain why coyotes have thrived in spite of early efforts to exterminate them (Connolly 1978).

Ecology of Red Foxes

Red foxes are the most common and well-known species in the genus *Vulpes* and are the most widely distributed nonspecific predators in the world (Voigt 1987). The red fox occurs throughout West Virginia and prefers diverse habitat that is made up of a patchwork of woodlots, open meadows, dense brushlands, pastures, and small wetlands (Henry 1986). Red fox were native to North America north of latitude 40° (Churcher 1959). European red fox were introduced into the eastern seaboard area about 1750 (Churcher 1959). Red foxes probably came into West Virginia between 1750 and 1800, entering from Pennsylvania (Voigt 1987).

Red foxes are regarded as nuisance predators in many regions, preying on wildlife and livestock, and have become notorious in many areas of the world as carriers of diseases (Ables 1969, Andrews et al. 1973, Tabel et al. 1974, Tullar et al. 1976, Pils and Martin 1978, Sargeant 1978, Voigt 1987, Allen and Sargeant 1993). Red foxes have been the subject of many studies during the last 20 years and investigations have revealed that foxes are extremely adaptive and diverse in their behavior and use of habitats. For example, Voigt and Earle (1983) and Gese et al. (1996) showed that red foxes were adaptive enough to avoid coyotes while coexisting in the same area and habitats.

Adult red foxes normally weigh between 6 and 15 pounds. The dorsal pelage is normally rusty-reddish to reddish-yellow intermixed with dark hairs in the middle of the back, while the fronts of the legs, feet, and back of ears are black, and the tail tip is white. The under parts are whitish or grayish-white. Three color phases have been reported: "cross" (pelage is mixed with gray and yellow, and gets its name from black cross formed by a line down the mid-back and another across the shoulders), "silver" (melanistic coat frosted with white), and "black" phases that are progressively darker. Red foxes feeding habits are governed by the relative availability of foods with rabbits and mice usually making up over half of the food consumed (Nelson 1933). Other foods include, squirrels, muskrats (*Ondatra zibethicus*), quail, song birds, insects, fruits and nuts (Pils and Martin 1978).

Red fox densities are difficult to determine because of the species' secretive and elusive nature. However, researchers have documented that the red fox has high reproductive and dispersal rates and thus, can withstand high mortality (Allen and Sargeant 1993, Voigt 1987, Voigt and MacDonald 1984, Harris 1979, Pils and Martin 1978, Storm et al. 1976, Andrews et al. 1973, Phillips and Mech 1970). Storm et al. (1976) stated that 95% of red fox females (44% were less than 1 year old) bred successfully in a population in Illinois and Iowa. Rowlands and Parkes (1935) and Creed (1960) reported that male red foxes successfully bred females during their first year. Red foxes average 4.7 pups per litter with litters of 14 to 17 pups documented (Storm et al. 1976, Voigt 1987). Ables (1969) and Sheldon (1950) reported that more than 1 female was observed at the den and suggested that red foxes have *"helpers"* that assist with raising pups, a phenomena observed in coyotes and other canids. Red fox population densities ranged from more than 50/mi^2 (Harris 1977, Harris and Rayner 1986, MacDonald and Newdick 1982) where food was abundant, to 2.6/mi^2 in Ontario (Voigt 1987), and to 1 fox den/3 mi^2 in Nebraska (Sargeant 1972).

Dispersal serves to equalize fox densities over large areas. Annual harvests in localized areas in 1 or more years will likely have little impact on the overall population in subsequent years, but may reduce localized predation (Allen and Sargeant 1993). Phillips (1970) stated that fox populations are resilient and in order for fox control (by trapping) to be successful, pressure on the population must be almost continuous. Phillips (1970) and Voigt (1987) also concluded that habitat destruction affects fox populations to a greater extent than short-term over-harvest.

Coyote and Red Fox Populations in West Virginia

The WVDNR provided harvest data (Table 4.1), but was unable to provide any definitive estimates of population sizes for purposes of the following analyses on impacts to the population. Therefore, WS used the best available information to produce reasonable estimates. Coyote populations in West Virginia are considered increasing based on trends in bow hunter surveys conducted by the WVDNR (Figure 4.1) (Warner et al. 2001). The red fox trend data took a big drop in 2000 from 1999 levels but the overall trend in red fox population for the past six years appears to be stable (Warner et al. 2001). Red fox harvest did not drop appreciably between the 1999 and 2000 seasons suggesting the drop was due to external factors. The WVDNR attributes the decline in red fox sightings on the bowhunter survey to weather and mast availability during the 2000 bowhunting season (Cliff Brown, WVDNR, Pers. Comm.). No complaints about declining red fox populations were reported from fur hunters or trappers during the 2000 hunting and trapping season (Cliff Brown, WVDNR, Pers. Comm.).

Table 4.1. Annual take of furbearing animals taken by licensed hunters and trappers in West Virginia as reported by West Virginia fur dealers[1], 1989-90 to 2000-01.

Year	Furbearer Species			
	Coyote	Red fox	Gray fox	Raccoon
1989-90	5	1261	1859	6773
1990-91	1	838	1332	4540
1991-92	6	813	2316	7518
1992-93	9	363	1004	4478
1993-94	3	162	611	3496
1994-95	38	558	1766	9532
1995-96	13	479	955	6790
1996-97	28	1181	1831	23262
1997-98	29	1019	1180	17846
1998-99	29	671	1111	9939
1999-00	43	359	933	4283
2000-01	49	334	1213	4350
Total	253	8038	16111	102807

1- Numbers do not include furs sold outside of West Virginia nor animals legally taken and not sold for fur.

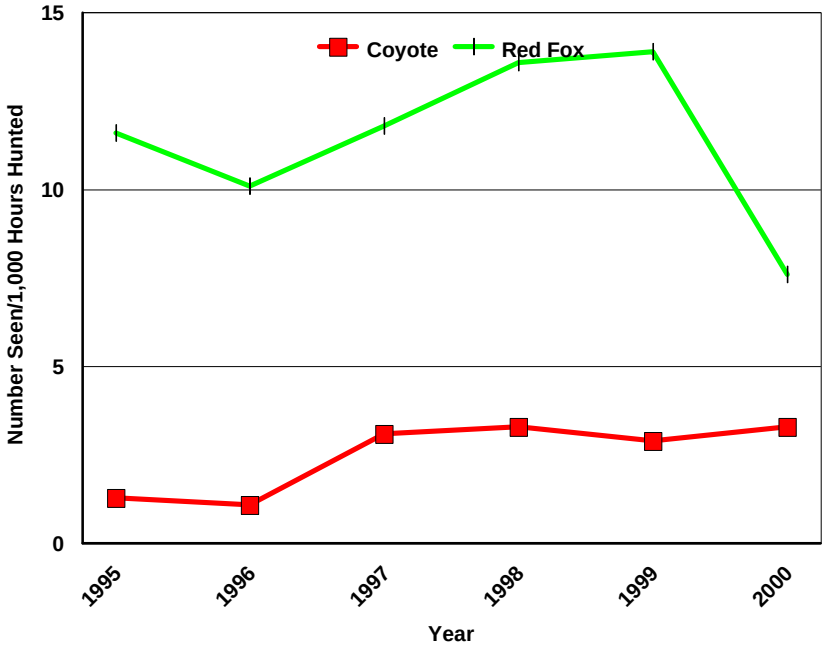

Figure 4.1. Population Trend Data for Coyotes and Red Foxes in West Virginia based on WV Division of Natural Resources bow hunter surveys, 1990-1999.

Alternative 1 - Technical Assistance Only

Under this alternative, WS would not be involved in control of coyote and red fox predation to livestock, other than by providing technical assistance. WS would have no direct impact on coyote and red fox populations. Impacts on coyote and red fox under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by land managers, but would likely be less than Alternative 6 since WS would be providing information to resource owner. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to real but unknown impacts on coyote or red fox populations.

Alternative 2 - Non-lethal Control Only

Under this alternative, WS would only implement non-lethal control methods and would not impact coyote or red fox populations. If non-lethal methods were successful in alleviating damage and the resource owner did not implement lethal control actions there would be no impact to coyote and fox populations by affected resource owners. However, in those situations where non-lethal methods were ineffective, the resource owner would likely reject WS non-lethal assistance and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would implement non-lethal control prior to the use of lethal methods. WS impacts to coyote and fox populations would be similar to Alternative 2 in those cases were non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal

methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods. In many situations, WS lethal methods would be applied as a result of unsuccessful attempts by land managers to alleviate predator damage through non-lethal methods resulting in impacts similar to the proposed action. In those situations where non-lethal methods were not implemented by resource owners, it is likely that a greater number of coyotes or red fox would have to be removed lethally by WS. However, based upon the population analysis provided under the proposed action, this potential increase in take would not result in adverse effects to local, regional or statewide coyote and red fox populations.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

Under this alternative, WS would incorporate select components form Alternatives 1, 2, 3, and 4. As stated in Section 2.2.1 and population impact analysis below, it is unlikely that WS would negatively impact target coyote and red fox populations on a regional, or statewide scale under this alternative. Some reduction in coyote and red fox populations may occur in localized areas where lethal control activities are implemented, but not to an extent that predator species would be permanently extirpated from an area. Local and regional immigration and emigration of coyotes and red foxes would be expected to replace removed target animals after a relatively short period of time.

Coyote and Red Fox Population Impact Analysis

Coyotes

Coyotes are a nuisance species (WVC §20-2-5 section 8) and are a nonnative furbearer legally hunted and trapped in West Virginia. They are also a pest species killed by farmers and other citizens because of the damage coyotes cause to livestock, agricultural crops, property, threats to human safety, or natural resources. The number of coyotes killed by farmers and other citizens is unknown and not measured by any survey.

Hunters and trappers legally removed at least 49 coyotes in West Virginia during the 2000-01 hunting and trapping season as reported by fur dealers (Table 4.1). These numbers grossly underestimate the actual take by hunters and trappers in West Virginia because many coyote pelts are sold to out-of-state fur dealers and auctions and were not represented in these data. In addition, many coyotes may have been shot or trapped by livestock producers and the fur pelts never sold. Therefore, the actual harvest of coyotes in West Virginia is much higher than data presented in this EA.

The WVDNR, as the agency with management responsibility for wildlife in West Virginia has classified the coyote as a nuisance furbearing mammal with few restrictions on sport harvest, depredation harvest, or season of take. Even though there is no season or restriction of harvest, coyote sightings from bow hunter surveys continue to increase (Figure 4.1).

WS has not adversely impacted the coyote population in similar programs in the Eastern U.S. (e.g., Virginia). During FY2001, WS removed 206 depredating coyotes from farms in 23 counties and have an average take of 121 coyotes per year since 1996 (unpublished MIS data) . WS expects that the coyote take in West Virginia will continue to be minor compared to sport hunting, trapping and other depredation take allowed by the WVDNR. Since depredating coyotes may already be killed by resource owners, the *status quo* for coyote populations and

human-caused coyote mortality in West Virginia would not be significantly affected with or without the involvement of the WS program.

WS anticipates that no more than 500 coyotes will be taken annually under the proposed action/no action. Therefore, 500 coyotes was used to analyze potential impacts to the statewide coyote population in West Virginia. The ADC FEIS (USDA 1997a) determined magnitude of total harvest using qualitative information based on State population trends. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Using the annual take of 500 coyotes by WS and the increasing trend of coyote populations in the State, the magnitude is considered extremely low for WS take of coyotes in West Virginia. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in the coyote population. WVDNR biologists have concurred with WS's finding that WS predator damage management activities will have no adverse effect on statewide coyote populations (P. Johansen, WVDNR, Pers. Comm.).

This information assures that cumulative impacts on the coyote population are within those desired by the State and would thus have no significant adverse impact on the quality of the human environment.

Red fox

Red fox are a furbearer species legally hunted and trapped in West Virginia. In addition, red fox may be killed by landowners with a permit from the WVDNR if they are causing damage (WVC §20-2-15b). The number of red fox killed by landowners and other citizens is unknown and not measured by any survey.

Hunter and trappers legally removed at least 334 red foxes in West Virginia during the 2000-01 hunting and trapping season as reported by fur dealers (Table 4.1). Similar to coyotes, these numbers underestimate the actual take by hunters and trappers in West Virginia because many red fox pelts are sold to out-of-state fur dealers and auctions and were not represented in these data. It is likely that fewer red fox than coyotes are shot by livestock producers because red fox are involved in fewer depredations on livestock than coyotes in West Virginia. Therefore, the actual harvest of red foxes in West Virginia may be much higher than data presented in this EA.

In FY2001, WS took 4 depredating red foxes and 15 nontarget red fox (unpublished MIS data) Since 1996 WS has taken an average of 2 depredating red foxes each year and average of 13 nontarget red foxes each year (unpublished MIS data) WS expects that its red fox take will continue to be minor compared to sport and other depredation take allowed by the WVDNR. The WVDNR reported in their bow hunter survey that red fox population are stable. Since depredating red fox may already be killed by resources owners, the *status quo* for red fox populations and human-caused red fox mortality in West Virginia would not be significantly different with or without the involvement of the WS program.

WS anticipates to kill no more than 100 red fox annually under the proposed action. Therefore, 100 red fox was used to analyze potential impacts to the statewide red fox population in West Virginia. The ADC FEIS (USDA 1997a) determined magnitude of total harvest using qualitative information based on State population trends. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Using the annual take of 100 red fox by WS and the stable trend of red fox populations in the State, the magnitude is considered moderate to low for WS take of red fox in West Virginia. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in the red fox population. WVDNR biologists have concurred with WS's finding that WS predator damage management activities will have no adverse effect on statewide red fox populations (P. Johansen, WVDNR, Pers. Comm.).

This information assures that cumulative impacts on the red fox population are within those desired by the State and would thus have no significant adverse impact on the quality of the human environment.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia

Coyote and red fox populations could continue to increase where trapping, hunting, and depredation take was low and some populations would decline or stabilize where trapping, hunting and depredation take was adequate. Some resource owners experiencing damage would trap or shoot coyotes and red fox, or hire private trappers but would receive no guidance from WS regarding these options. Resource owners experiencing damage may take illegal or unsafe action against local populations of coyote and red fox out of frustration of continued damage. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to real but unknown impacts on coyote or red fox populations. Impacts on coyote and red fox under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by the resource owner.

4.1.2 Effects on Dogs, Wolf-hybrids, and Exotic Carnivores

Alternative 1 - Technical Assistance Only

Under this alternative, WS would not be involved in control of dog, wolf-hybrid, or exotic carnivore predation to livestock, other than by providing technical assistance. WS would have no direct impact on dog, wolf-hybrid, and exotic carnivore populations. Impacts on dog, wolf-hybrid, and exotic carnivore populations under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by the resource owner, but would likely be less than Alternative 6 since WS would be providing information to resource owners. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to real but unknown impacts on dog, wolf-hybrid, and exotic carnivore populations.

Alternative 2 - Non-lethal Control Only

Under this alternative, WS would only implement non-lethal control methods and would not directly effect dogs, wolf-hybrids, and exotic carnivores. If non-lethal methods were successful in alleviating damage and the resource owner did not implement lethal control actions there would be no impact to dog, wolf-hybrid, and exotic carnivore populations by affected resource owners except if livestock producers use guard dogs (a non-lethal method) recommended by WS, then some hunting or companion dogs may be killed by guard dogs if those dogs enter pastures protected by guard dogs. However in those situations where non-lethal methods were ineffective, the resource owner would likely reject WS non-lethal assistance and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would implement non-lethal control prior to the use of lethal methods. WS impacts to dog, wolf-hybrid, and exotic carnivore populations would be similar to Alternative 2 in those cases were non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods. Unfortunately, some dog owners fail to follow state laws by restraining their dogs, putting these dogs at risk. Some dogs are at risk because a few hunters fail to get landowner permission and they trespass unaware of the hazards their dogs may encounter. In many situations, WS lethal methods would be applied as a result of unsuccessful attempts by land managers to alleviate predator damage through non-lethal methods resulting in impacts similar to the proposed action. In those situations where non-lethal methods were not implemented by resource owners, it is likely that a greater number of dog, wolf-hybrid, and exotic carnivores would have to be removed lethally by WS. However, based upon the analysis provided under the proposed action, this potential increase in take would not result in adverse effects to local, regional or statewide dog, wolf-hybrid, and exotic carnivore populations.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

Under this alternative, WS would incorporate select components form Alternatives 1, 2, 3, and 4. As stated in Section 2.2.2, it is unlikely that WS would negatively impact dog, wolf-hybrid, or exotic carnivore pets on a local, regional, or statewide scale under this alternative. Removal of the offending animal may occur in localized areas where lethal control activities are implemented, but not to an extent that companion animals would be impacted. During FY2001 WS took 2 depredating feral dogs and since 1996 have an average take of 1.3 feral dogs per year. In addition the total nontarget take of dogs since 1996 is 5 and these dogs were the property of WS cooperators that did not strictly adhere to WS instructions to keep pets tied or penned (unpublished MIS data). Some pet owners release unwanted pets into the country after they find they cannot keep these animals as pets for various reasons (e.g., amount of food required, size and aggressiveness, etc.). These animals become hungry and indiscriminate killers and because they are not afraid of humans, they attack and kill pets and livestock. Because these feral animals are the individuals targeted by WS, hunting and companion animals properly and legally restrained by pet owners would not be harmed by WS activities.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia.

Some resource owners experiencing damage would lethally remove depredating dogs, wolf-hybrids, and exotic carnivores but would receive no guidance from WS. Resource owners experiencing damage may take illegal or unsafe action against local populations of dog, wolf-hybrid, and exotic carnivores out of frustration of continued damage. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to real but unknown impacts on dog, wolf-hybrid, and exotic carnivore populations. Impacts on dog, wolf-hybrid, and exotic carnivore populations under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by the resource owner.

4.1.3 Effects on Non-target Wildlife Populations, including T&E Species

Alternative 1 - Technical Assistance Only

Under this alternative, WS would not be involved in any direct control methods to reduce livestock predation; therefore, there would be no impact by WS on any non-target or T&E species. However, predation to livestock would continue throughout West Virginia, providing that land managers did not implement their own wildlife damage management program. Efforts by land managers and other entities to reduce or prevent depredations could increase, potentially resulting in adverse affects to non-target species such as: bobcats (*Felis rufus*), black bears (*Ursus americanus*), river otters (*Lutra canadensis*), and bald eagles (*Haliaeetus leucocephalus*). The bald eagle is a West Virginia Threatened species. (Appendix C). For example, shooting, trapping, and snaring by persons not proficient at mammal

identification could lead to capture or killing of non-target and T&E species. Even though WS is providing technical information, measures to avoid capturing non-target and T&E species may not be employed by resource owners, leading to impacts similar to Alternative 6. It is hypothetically possible that frustration caused by the inability to reduce predation losses could lead to illegal use of chemical toxicants which could impact non-target and T&E species. Hazards to raptors, including bald eagles, could also be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

Alternative 2 - Non-lethal Control Only

Under this alternative, no risks to wildlife populations or T&E species by WS activities are anticipated since WS would only implement non-lethal control methods to reduce livestock predation. If livestock producers use guard dogs (a non-lethal method) recommended by WS, some non-target species may be killed if those animals enter pastures protected by guard dogs. Landowners experiencing livestock predation problems which were not effectively resolved by non-lethal control methods and recommendations would likely resort to other means of control such as use of shooting, trapping, and snaring by private persons or even illegal use of chemical toxicants. These measures may result in less experienced persons implementing control methods and may lead to greater take of non-target and T&E species than the proposed action. For example, trapping or snaring by persons not proficient at mammal sign identification could lead to killing more deer, fox, raccoon, bobcats, and other animals than the proposed action. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on non-target and T&E species populations. Hazards to raptors, including bald eagles, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would implement non-lethal control prior to the use of lethal methods. As stated in Section 2.2.3, it is not likely that WS would negatively impact non-target or T&E species populations on a local, regional, or statewide scale under this alternative. WS impacts to non-target and T&E species populations would be similar to Alternative 2 in those cases were non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods. WS impacts to non-target and T&E species would be similar to the proposed action.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

Under this alternative, WS would incorporate select components from 1, 2, 3, and 4. As stated in Section 2.2.3, it is unlikely that WS would negatively impact non-target and T&E species populations on a local, regional, or statewide scale under this alternative. No adverse impacts on any of the listed birds, mammals, invertebrates, fish, reptiles, amphibians, or plants (Appendix C) are expected by WS operational activities. Mitigation measures to avoid T&E impacts were described in Chapter 3 (Section 3.5.3).

However, it is possible that WS may capture bobcats and black bears while attempting to capture the offending predator, though bobcats and black bears are known predators of livestock. WS will make every attempt to avoid capturing bobcats and, if captured, will ensure they are released unharmed when possible. Since 1996 WS has captured 10 nontarget bobcats averaging 1.6 takes per year. WS has taken 3 nontarget black bears and informed the WVDNR of the situation. WVDNR biologists have concurred with WS's finding that WS predator damage management activities will have no adverse effects on local, regional, or statewide wildlife and State Listed T&E species populations (C. Stihler, WVDNR, Pers. Comm.).

Non-target species that are inadvertently captured in live traps (i.e., foothold traps and snares) would be released, if it is determined that it is safe to do so and if the animal is injury free. Non-target species captures are minimized by WS selection of appropriate trap size, pan tension, attractants (baits), and site selection. Daily trap checks would further minimize risk to non-target species. Risks associated with snares are greatest for animals that frequent the areas where snares are placed and travel along paths of the targeted animals. Non-target species risks will further be minimized by adjusting the size of the snare loop and the height of placement. Proper loop size and placement allows animals smaller than the target species to pass under or through the snare unharmed and those animals larger than the target species to step or jump over the snare. The use of break-away locks and stops (device used to prevent a snare from completely closing) would allow animals larger than the target species to break free of the snare or to be released.

The inherent safety features of M-44's and LPC's that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the ADC FEIS (USDA 1997a, Appendix P). Those measures and characteristics assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from the proposed action. M-44 devices and Livestock Protection Collars would only be used in areas where it is determined that non-target (especially T&E) species would not be affected by the use of these control methods.

WS activities in livestock protection may indirectly benefit some species that are preyed upon by coyotes, red foxes, feral dogs, wolf-hybrids, and exotic carnivores. The benefits would be highly localized and most likely on the property WS is assisting, or on adjacent properties of those landowners. The wildlife species likely to benefit because of the reduced threat of predation include: white-tailed deer, groundhogs (*Marmota spp*.), rabbits (*Sylvilagus spp*. and *Lepus spp.*), mice (*Peromyscus spp*.) Voles (*Microtus spp.*), bobwhite quail, ruffed grouse, and wild turkey.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia

In the absence of WS assistance, some resource owners may attempt to remove predators or hire private trappers with little or no trapping experience. These resource owners or trappers would be more likely than WS personnel to trap non-target species and not report non-target take. It is hypothetically possible that frustration caused by the inability to reduce predation losses could lead to illegal use of chemical toxicants which could impact non-target and T&E species. Hazards to raptors, including bald eagles, could also be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

4.1.4 Effects on Human Health and Safety

Alternative 1 - Technical Assistance Only

Under this alternative, WS would not be involved in any direct control methods to reduce livestock predation; therefore, there would be no impact on human health or safety by WS. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing

damage management methods and potentially leading to greater risk to human health and safety than the Proposed Action, although not to the point that they would be substantial. Individuals that are less experienced with firearms, traps and snares may not be selective when targeting predators, thus increasing the potential to injure humans. In addition, hazards to humans could be greater under this alternative if chemicals that are less selective and cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects on humans than those recommended under the Proposed Action/No Action.

Alternative 2 - Non-lethal Control Only

Under this alternative, only non-lethal methods would be used or recommended by WS. A formal risk assessment of WS operational management methods found that risks to human safety were low (USDA 1997a, Appendix P). There are currently no registered non-lethal chemicals available for use on predators; therefore, any concerns of WS use of chemicals would be eliminated under this alternative. However, excessive cost or ineffectiveness of non-lethal techniques could result in some entities rejecting WS assistance and resorting to other means of control, including the possibility of illegal use of pesticides, resulting in impacts similar to Alternative 6.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would be required to implement non-lethal methods prior to the implementation of lethal methods. WS impacts on human health and safety would be similar to Alternative 2 in those cases where non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods to reduce predation on livestock in West Virginia. WS impacts on human health and safety would be similar to the proposed action.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

Under this alternative, WS would continue the current program select components from Alternatives 1, 2, 3, and 4. A formal risk assessment of WS operational management methods found that risks to human safety were low (USDA 1997a, Appendix P). In addition, APHIS conducted a thorough Risk Assessment, and concluded that, WS use of chemical methods are in accordance with label directions, and are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997a).

Methods that may be used by WS include: trapping, snaring, shooting, and calling and shooting, the M-44 device, LPC, and Large Gas Cartridge.

Trapping and snaring

Traps and snares may be used or recommended by WS and do not pose a threat to human health and safety. There are many misconceptions about foothold traps and snares. Regulations exist to prohibit use of traps that cause damage to the user or anyone that may encounter a set trap. For example, in West Virginia the legal jaw spread for terrestrial traps must be < 6 1/2", and traps are not to be set human or livestock paths. In addition, the BMP process addresses user safety ensuring that traps and snares are safe. It is possible that an individual may accidentally step into a trap and get their toe caught; however, a person can easily pull their foot out of the trap without damage or even a bruise. Similarly, it is unlikely that an individual would get entangled in a snare set for a target species. However, one can easily remove a snare by pushing the locking device in the opposite direction to open up the snare loop. More detailed information about traps and snares are provided in Section 2.2.4.2 and Appendix B.

Shooting and calling and shooting

WS personnel may occasionally employ or recommend the use of rifles and shotguns to remove target species preying upon or attempting to prey upon livestock. Handguns may also be used to humanely euthanize trapped or snared animals. WS SOP's include measures intended to mitigate or reduce the effects on human health and safety and are presented in Chapter 3. Safety issues related to the misuse of firearms and the potential human hazards associated with firearms use are concerns both to the public and WS. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. The West Virginia WS program conducts annual firearms training for all personnel. More detailed information about shooting practices are provided in Section 2.2.4.2 and Appendix B.

M-44's

The M-44 (sodium cyanide ejector mechanism) is a lethal chemical control method which may be used. There has been some concern expressed by members of the public that unknown but significant risks to human health may exist from M-44's used for predator management.

Currently, the M-44 device is registered for use in the State of West Virginia, and is used for livestock protection by our registered applicators. This chemical has been extensively researched and evaluated for registration with EPA to control canine predation on livestock and for protecting threatened and endangered species. No WS employee has ever been killed by an M-44 device in 55 years of use by WS. According to the EPA, out of greater than 400,000 recorded exposures to all types of animal toxicants, there has never been an M-44 exposure. Factors which virtually eliminate any risk of public health or safety problems from use of M-44's include:

- Follow M-44 label directions including the 26 use restrictions required by EPA and directions in the Predator Management Training Manual (Lowney 1996) or a similar publication.
- All employees using M-44's carry amyl nitrate antidote kits.
- Poison control centers would be notified about use of sodium cyanide in West Virginia.
- Sodium cyanide rapidly breaks down when exposed to the environment.
- Because sodium cyanide rapidly breaks down when exposed to the environment, persons handling exposed dead animals would not be exposed.
- Sodium cyanide registered by WS has an orange marking dye which would indicate exposure of sodium cyanide if found on clothing, skin, or fur.
- The maximum application rates are extremely low (less than 12 grams per square mile) (see M-44 restricted use pesticide label).

- A human would need to orally ingest or inhale sodium cyanide from the M-44 to be harmed or die. This would mean pulling up on an M-44 embedded in the ground, the head of which is baited with rancid meat paste. The sodium cyanide would then have to be ejected into the mouth or face to receive this chemical or its metabolites into his/her system. This is highly unlikely to occur.
- M-44's are only used within fenced pastures and fields typically grazed by livestock.
- Warning signs are posted at entryways of the farm and within 25 feet of each M- 44.
- Property owners adjacent to the property where M-44's are to be placed are notified.
- WS personnel are certified in West Virginia as restricted-use pesticide applicators.

The above analysis indicates that human health risks from M-44 use would be virtually nonexistent.

Livestock Protection Collars

The LPC is another chemical method used in West Virginia by our registered applicators. Appendix B provides more detailed information on this chemical.

The LPC consists of a rubber collar with two rubber reservoirs (bladders), each of which contains 15 milliliters (ml) of a 1-percent solution of sodium fluoroacetate. The LPC has Velcro straps for attachment around the neck of a sheep or goat with the reservoirs positioned just behind the jaw. Two collar sizes are available to accommodate various size livestock.

Coyotes typically attack sheep and goats by biting them on the throat and crushing the larynx, causing suffocation. Coyotes that attack collared sheep generally puncture the collar with their teeth (in 75% or more of attacks) and receive a lethal oral dose of toxicant. There has been limited use of LPC's in the Eastern U.S.; for example in Virginia during FY 1996-2001, 375 ml of sodium fluoroacetate from LPC's was exposed from puncturing by coyotes. West Virginia has used 960 ml during FY 1996-2001. Factors which virtually eliminate any risks of public health or safety problems from use of LPC's include:

- The toxicant (sodium fluoroacetate) is contained within rubber bladders worn by livestock which makes it unlikely the public will come into contact with LPC's.
- A human would need to ingest liquid toxicant from one of the rubber bladders to have any chance of receiving the chemical into his/her system, which is highly unlikely to occur.
- Secondary hazard studies with mammals and birds have shown that there is no hazard of secondary poisoning.
- Warning signs are placed at the entrance of farms where sheep or goats collared with LPC's are located within fenced pastures.
- Warning labels are attached to all LPC's informing a person about the toxic nature of the contents.
- WS personnel are certified in West Virginia as restricted-use pesticide applicators.
- There is a yellow dye mixed with the sodium fluoroacetate in the LPC which serves as a warning that the LPC has been punctured and precautionary measures such as wearing rubber gloves need to be taken.
- WS personnel follow label instructions and directions in the Predator Management Training Manual (Lowney 1996) or a similar publication.
- LPC devices are checked daily by the cooperator and weekly by the applicator to ensure proper fit and that they were unbroken.

The above analysis indicates that human health risks from sodium fluoroacetate (LPC) use would be virtually nonexistent.

Large Gas Cartridges

Another lethal chemical which may be used or recommended by WS includes the Large Gas Cartridge (Sodium nitrate). The Large Gas Cartridge is placed in burrows/dens and is burned to create carbon monoxide gas to euthanize animals. Applicators must exercise caution to avoid burns to the skin or surrounding vegetation. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health and safety. The Large Gas Cartridge is registered for use in the State of West Virginia by registered applicators for livestock protection.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia

Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the Proposed Action, although not to the point that they would become substantial. Individuals that are less experienced with firearms, traps and snares may not be selective when targeting predators, thus increasing the potential to injure humans. In addition, hazards to humans could be greater under this alternative if chemicals that are less selective and cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects on humans than those recommended under the Proposed Action.

4.1.5 Humaneness of Control Methods Used by WS

Alternative 1 - No Action, Technical Assistance Only

Under this alternative, WS would not be involved in any control methods to reduce livestock predation. Therefore, no direct impacts would be experienced by any wildlife species or population as a result of WS operational control methods. Efforts by land managers and other entities to reduce predation to livestock could increase, potentially resulting in inhumane captures or deaths of the target species and non-target species including T&E species, pets, and native wildlife. It is hypothetically possible that frustration caused by the inability to alleviate damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards and inhumane death or sickness to pets and to mammalian and avian scavengers. Overall negative impacts on humaneness by resource owners and other entities should be similar to Alternative 6.

Alternative 2 - Non-lethal Control Only

Under this alternative, only non-lethal methods would be used or recommended by WS. If livestock producers use guard animals (a non-lethal method) recommended by WS, it is possible that guard animals may attack predators or non-target animals that are perceived as a threat and cause, by some peoples perception, an inhumane attack or death. However, because non-lethal techniques may not always stop damage to livestock from predators, efforts by land managers and other entities to reduce predation to livestock could increase, potentially resulting in inhumane captures or deaths of the target species and non-target species including T&E species, pets, and native wildlife, similar to Alternative 6. It is hypothetically possible that frustration caused by the inability to alleviate damage could also lead to illegal use of certain toxicants that could pose secondary poisoning hazards and inhumane death or sickness to pets and to mammalian and avian scavengers. Persons or groups opposed to the live capturing and

restraining of animals (i.e., traps and snares) or any type of lethal control would most likely prefer this alternative to Alternatives 3, 4, or 5.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would be required to implement non-lethal methods prior to the implementation of lethal methods. WS impacts on humaneness would be similar to Alternative 2 in those cases were non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods to reduce predation on livestock in West Virginia. Lethal methods are often applied by WS as a result of unsuccessful attempts by land managers to alleviate predator damage to their livestock through non-lethal methods. WS impacts on humaneness would be similar to the proposed action.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action/No Action)

Under this alternative, WS would incorporate select components from Alternatives 1, 2, 3, and 4. WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Under this alternative, predators would be trapped as humanely as possible or shot by experienced WS personnel using the best methods available. Some persons may perceive this method as inhumane because they oppose all lethal methods of damage management. This alternative allows WS to consider non-lethal methods, and WS would implement non-lethal methods when appropriate.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia

This alternative would be considered humane by many people opposed to WS and the assistance provided. Producers may consider this alternative inhumane because of the gruesome injuries and deaths their livestock experience from predators. Resource owners could use lethal and non-lethal methods to reduce predator damage. The proper selection and most humane use of methods may not occur as persons without sufficient experience may attempt to implement damage management techniques. In addition, some resource owners may take illegal action against localized populations of predators out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by experienced WS personnel.

4.1.6 Effects on the Aesthetic Values of Target and Non-target Species

Alternative 1 - Technical Assistance Only

Under this alternative, WS would not be involved in any direct control methods to reduce livestock predation in West Virginia. Therefore, WS effects on any aesthetic values to target and non-target species would be nonexistent. Some people and/or groups who oppose any wildlife damage control by government agencies or other groups and individuals would likely support this alternative. People and/or groups who have affectionate bonds with individual animals or animals in general, would not be affected

by WS activities as stated in this alternative. Conversely, large segments of the public who consume and utilize byproducts of livestock and poultry and especially those whose livelihood depends on these animals would be impacted negatively because of the continued level and potential increase in livestock predation. However, it is likely that land managers or other individuals would conduct predator management, with or without WS technical advice, where predators are killing livestock, but the extent of the effectiveness of these individuals may be limited. Overall negative impacts on aesthetic values by landowners and other entities should be similar to Alternative 6.

Alternative 2 - Non-lethal Control Only

Under this alternative, only non-lethal methods would be used or recommended by WS. No impacts to the aesthetic values of target and non-target species would be expected as the direct result of WS non-lethal activities or recommendations. People and/or groups who have affectionate bonds with individual animals or animals in general, would not be affected by WS activities as stated in this alternative. Conversely, large segments of the public who consume and utilize byproducts of livestock and poultry and especially those whose livelihood depends on these animals would be impacted negatively if non-lethal methods were ineffective at reducing predation to acceptable levels. However, because non-lethal techniques may not always stop damage to livestock from predators, efforts by land managers and other entities to reduce predation to livestock could increase, resulting in impacts similar to Alternative 6.

Alternative 3 - Non-lethal Control Before Lethal Control

Under this alternative, WS would implement non-lethal control methods prior to the use of lethal methods. WS impacts on aesthetic values would be similar to Alternative 2 in those cases were non-lethal methods effectively reduced predation levels to acceptable levels and would be similar to the proposed action when lethal methods were implemented by WS. However, because non-lethal control must be applied before lethal control, predation to livestock may not be reduced in a timely and effective manner. In those situations, resource owners may be unwilling to accept further losses as all available non-lethal methods are applied. This could result in resource owners rejecting WS non-lethal methods and implement their own lethal control program resulting in impacts similar to Alternative 6.

Alternative 4 - Lethal Control Only

Under this alternative, WS would implement and recommend lethal control methods without applying or considering non-lethal methods to reduce predation on livestock in West Virginia. WS impacts on aesthetic values of predators would likely be greater under this alternative than proposed action since lethal methods would be used in all damage situations.

Lethal removal of predators would occur in localized areas. In these localized areas, target species populations may be impacted in the short term; however, the impact to the species would be insignificant to the overall population in a region or statewide. Therefore, target and non-target species would remain common and abundant for hunting and viewing opportunities for the general public. Target predator species under this EA are typically secretive in nature and viewing opportunities are limited because of their habits. It may be perceived by some that WS activities may contribute to limited viewing opportunities; however, animals removed from the population will be replaced by immigrants from outlying areas in a short period of time where localized population control efforts take place. Others like to listen to coyotes and consider it important to know that they are in an area.

Some individuals or groups are opposed to any killing of animals. Some do not believe that predators should be harassed or killed to stop or reduce damage problems and that predation is part of doing business as a livestock producer.

Resource owners negatively affected by predation and those individuals that feel predators are negatively affecting their aesthetic values of other wildlife species would likely support this alternative since this alternative has the potential of reducing predation to acceptable levels in many situations.

Alternative 5 - Integrated Wildlife Damage Management (Proposed Action /No Action)

Under this alternative, WS would incorporate select components from Alternatives 2, 3, and 4. Removal of predators may occur in localized areas where lethal control activities are implemented. In these localized areas, target species populations may be impacted in the short term; however, the impact to the species would be insignificant to the overall population in a region or statewide. Therefore, target and non-target species would remain common and abundant for hunting and viewing opportunities for the general public. Target predator species under this EA are typically secretive in nature and viewing opportunities are limited because of their habits. It may be perceived by some that WS activities may contribute to limited viewing opportunities; however, animals removed from the population will be replaced by immigrants from outlying areas in a short period of time where localized population control efforts take place. Others like to listen to coyotes and consider it important to know that they are in an area.

Some individuals or groups are opposed to any killing of animals, under this alternative some lethal control will occur and those individuals or groups would continue to be opposed regardless of methods used. Some do not believe that predators should be harassed or killed to stop or reduce damage problems and that predation is part of doing business as a livestock producer.

Resource owners negatively affected by predation and those individuals that feel predators are negatively affecting their aesthetic values of other wildlife species would likely support this alternative. This alternative has the greatest potential of reducing predation to acceptable levels since all control methods could be considered and used under this alternative.

Alternative 6 - No Federal WS Predator Damage Management in West Virginia

The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Resource owners receiving damage from predators would likely strongly oppose this alternative because they would bear the damage caused by depredating carnivores. Animal and environmental activists would prefer this alternative because activists believe it is morally wrong to kill or use animals for any reason. Some people would support this alternative because they enjoy seeing predators, or having predators nearby. However, while WS would take no action under this alternative, other individuals or entities could, and likely would, conduct damage management activities.

4.2 CUMULATIVE IMPACTS

No significant or cumulative adverse environmental consequences resulting from the Proposed Action are anticipated (Table 4.2). Under the Proposed Action, the lethal removal of coyotes and red foxes would not have a significant impact on overall coyote or red fox populations in West Virginia, but some local reductions may occur. Control activities will not negatively impact other protected flora or fauna in West Virginia. The Proposed Action is supported by the WVDNR, the agency responsible for managing coyotes, red foxes and other flora and fauna in the State (P. Johnasen, C. Stihler, WVDNR, Pers. Comm.). No threatened or endangered species or critical habitat would be adversely impacted by the Proposed Action. No risk to public safety is expected by WS activities since only trained and experienced wildlife biologists and wildlife specialists would conduct and recommend control measures for livestock losses due to predation. There is a slight increased risk to public safety when control activities are conducted by persons that reject WS assistance and recommendations, but not to the extent that they would be significant. Although some persons will likely be opposed to WS participation in control activities to protect livestock from predation, the analysis in this EA indicates that WS Integrated Wildlife Damage

Management program will not result in significant cumulative adverse impacts on the quality of the human environment.

Table 4.2. Summary of the potential effects of the Alternatives as it pertains to the identified Issues. Potential effects include both positive and negative, when applicable.

ISSUES	ALTERNATIVE 1 No Action, Technical Assistance Only	ALTERNATIVE 2 Non-lethal Control Only	ALTERNATIVE 3 Non-lethal Control Before Lethal Control	ALTERNATIVE 4 Lethal Control Only	ALTERNATIVE 5 Integrated Wildlife Damage Management (Proposed Action)	ALTERNATIVE 6 No Federal WS Predator Damage Management Program
EFFECTS ON TARGET SPECIES (COYOTE AND RED FOX) SPECIES POPULATIONS	No impact would occur from WS activities. However, moderate impacts to local or regional coyote and red fox populations could occur from inexperienced producers and others conducting control efforts.	No impact would occur from WS activities. However, moderate impacts to local or regional coyote and red fox populations could occur from inexperienced producers and others conducting control efforts.	Low impact to coyote and red fox populations regionally or statewide; however, local impacts could be larger than Alternatives 1,2 and 6.	Low impact to coyote and red fox populations regionally or statewide; however, local impacts could be larger than Alternatives 1, 2 and 6.	Low impact to coyote and red fox populations regionally or statewide; however, local impacts could be larger than Alternatives 1, 2 and 6.	No impact would occur from WS activities. However, moderate impacts to local or regional coyote and red fox populations could occur from inexperienced producers and others conducting control efforts.
EFFECTS ON DOGS, WOLF-HYBRIDS, AND EXOTIC CARNIVORES	No impact would occur from WS activities. However, low impacts to pet dogs, wolf-hybrids, and exotic carnivores may occur from inexperienced producers and others conducting control efforts.	No impact would occur from WS activities. However, low impacts to pet dogs, wolf-hybrids, and exotic carnivores may occur from inexperienced producers and others conducting control efforts.	Low impact to pet dogs, wolf-hybrids, and exotic carnivores; however, local impacts to feral domesticated animals could be larger than Alternatives 1, 2 and 6.	Low impact to pet dogs, wolf-hybrids, and exotic carnivores; however, local impacts to feral domesticated animals could be larger than Alternatives 1, 2 and 6.	Low impact to pet dogs, wolf-hybrids, and exotic carnivores; however, local impacts to feral domesticated animals could be larger than Alternatives 1, 2 and 6.	No impact would occur from WS activities. However, low impacts to pet dogs, wolf-hybrids, and exotic carnivores may occur from inexperienced producers and others conducting control efforts.
EFFECTS ON NON-TARGET WILDLIFE POPULATIONS, INCLUDING T&E SPECIES	No impact would occur from WS activities. However, moderate impacts to local or regional non-target populations, including T&E species may occur from inexperienced producers and others conducting control efforts.	No impact would occur from WS activities. However, moderate impacts to local or regional non-target populations, including T&E species may occur from inexperienced producers and others conducting control efforts.	Low impact to non-target and T&E species would occur from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	Low impact to non-target and T&E species would occur from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	Low impact to non-target and T&E species would occur from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	No impact would occur from WS activities. However, moderate impacts to local or regional non-target populations, including T&E species may occur from inexperienced producers and others conducting control efforts.
EFFECTS ON HUMAN HEALTH AND SAFETY	No risk to human health and safety from WS activities. A greater risk may occur from inexperienced producers and others conducting control efforts and misusing firearms or pesticides.	No risk to human health and safety from WS activities. A greater risk may occur from inexperienced producers and others conducting control efforts and misusing firearms or pesticides.	Low risk to human health and safety from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	Low risk to human health and safety from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	Low risk to human health and safety from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	No risk to human health and safety from WS activities. A greater risk may occur from inexperienced producers and others conducting control efforts and misusing firearms or pesticides.
HUMANENESS OF CONTROL METHODS USED BY WS	No impact from WS activities. However, humane techniques may not be used by producers or others conducting control efforts.	No impact from WS activities. However,-humane techniques may not be used by producers or others conducting control efforts.	Low impact from WS activities. WS impacts would be greater than Alternatives 1, 2 and 6, but would be as humane as possible using available resources and technologies.	Low impact from WS activities. WS impacts would be greater than Alternatives 1, 2 and 6, but would be as humane as possible using available resources and technologies.	Low impact from WS activities. WS impacts would be greater than Alternatives 1, 2 and 6, but would be as humane as possible using available resources and technologies.	No impact from WS activities. However, humane techniques may not be used by producers or others conducting control efforts.
EFFECTS ON	No impact from	No impact from	Low impact to the	Low impact to the	Low impact to the	No impact from

THE AESTHETIC VALUES OF TARGET AND NON-TARGET SPECIES	WS activities. However, there may be moderate impacts to local or regional target and non-target species from techniques used by inexperienced producers and others conducting control efforts.	WS activities. However, there may be moderate impacts to local or regional target and non-target species from techniques used by inexperienced producers and others conducting control efforts.	aesthetic values of target and non-target species from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	aesthetic values of target and non-target species from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	aesthetic values of target and non-target species from WS activities. However, impacts from WS activities would likely be lower than if inexperienced producers and others were conducting control efforts.	WS activities. However, there may be moderate impacts to local or regional target and non-target species from techniques used by inexperienced producers and others conducting control efforts.

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

5.1 PREPARERS

William R. Bonwell	USDA, APHIS, WS - State Director
John T. Forbes	USDA, APHIS, WS - Wildlife Biologist
David S. Reinhold	USDA, APHIS, WS - Environmental Management Coordinator

5.2 REVIEWERS AND CONSULTATIONS

Cliff Brown	Wildlife Biologist, West Virginia Division of Natural Resources
James Evans	Wildlife Biologist, West Virginia Division of Natural Resources
James Pack	Wildlife Biologist, West Virginia Division of Natural Resources

APPENDIX A: BIBLIOGRAPHY AND LITERATURE CITED

Ables, E. D. 1969. Activity studies of red foxes in southern Wisconsin. J. Wildl. Manage. 33: 145-153.

Allen, S. H., and A. B. Sargeant. 1993. Dispersal patterns of red foxes relative to population density. J. Wildl. Manage. 57: 526-533.

Allen, S. H., J. O. Hastings, and S. C. Kohn. 1987. Composition and stability of coyote families and territories in North Dakota. Prairie Nat. 19: 107-114.

Althoff, D. P. 1978. Social and spatial relationships of coyote families and neighboring coyotes. M.S. Thesis, Univ. of Nebraska, Lincoln, NE.

Andelt, W. F., and P. S. Gipson. 1979. Home range, activity, and daily movements of coyotes. J. Wildl. Manage. 43(4): 944-951.

Andrews, R. D., G. L. Storm, R. L. Phillips, and R. A. Bishop. 1973. Survival and movement of transplanted and adopted red fox pups. J. Wildl. Manage. 37: 69-72.

AVMA. 2000. 2000 report of the AVMA panel on euthanasia. J. Amer. Vet. Med. Assoc. 218: 669-696.

Bailey, J. A. 1984. Principles of wildlife management. John Wiley and Sons, Inc. 373 pp.

Bekoff, M., and M. C. Wells. 1982. Behavioral ecology of coyotes: social organization, rearing patterns, space use, and resource defense. Z. Tierpsychol. 60: 281-305.

Berg, W. E. and R. A. Chessness. 1978. Ecology of coyotes in northern Minnesota. Pages 229-247 in M. Bekoff, ed., Coyotes: biology, behavior and management. Academic Press, New York, NY.

Berryman, J. H. 1991. Animal damage management: responsibilities or various agencies and the need for coordination and support. Proc. East. Wildl. Damage Control Conf. 5: 12-14.

Bishop, R. C. 1987. Economic values defined. Pages 24-33 in D. J. Decker and G. R. Goff, eds., Valuing wildlife: Economic and social perspectives. Westview Press, Boulder, CO.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proc. Annu. Conf. Southeast Assoc. Fish and Wildl. Agencies. 43: 470-478.

Blejwas, K. M., B.N. Sacks, M. M. Jaeger, and D. R. McCullough. 2002. The effectiveness of selective removal of breeding coyotes in reducing sheep predation. Journal of Wildlife Management 66. In press.

Boggess, E. K., G. R. Batcheller, R. G. Linscombe, J. W. Greer, M. Novak, S. B. Linhart, D. W. Erickson, A. W. Tood, D. C. Juve, and D. A Wade. 1990. Traps, trapping, and furbearer management. Wildl Soc. Tech. Rev. 90-1. 31 pp.

Camenzind, F. J. 1978. Behavioral ecology of coyotes on the National Elk Refuge, Jackson, Wyoming. Pages 267-294 in M. Bekoff, ed., Coyotes: biology, behavior and management. Academic Press, New York, NY.

Cavalcanti, S. M. C., and F. F. Knowlton. 1998. Evaluation of physical and behavioral traits of llamas associated with aggressiveness toward sheep-threatening canids. App. Animl. Behav. Sci. 61: 143-158.

CDFG. 1991. California Department of Fish and Game. Final environmental document - bear hunting. Sections 265, 365, 366, 367, 367.5 Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, State of California, April 25, 1991. 13 pp.

Chambers, R. E. 1992. Reproduction of coyotes in their northeastern range. Pages 39-52 in A. H. Boer, ed., Ecology and management of the eastern coyote.

Churcher, C. S. 1959. The specific status of the new world red fox. J. Mammal. 40(4): 513-520.

Clark, F. W. 1972. Influence of jackrabbit density on coyote population change. J. Wildl. Manage. 36: 343-356.

Conner, M. M., M. M. Jeager, T. J. Weller, and D. R. McCullough. 1998. Impact of coyote removal on sheep depredation. Journal of Wildlife Management 62: 690-699.

Connolly, G. E. 1978. Predators and predator control. Pages 369-394 in J. L. Schmidt, and D. L. Gilbert, eds., Big game of North America: ecology and management. Wildl. Manage. Inst., Washington, DC.

Connolly, G. E. 1981. Limiting factors and population regulation. Pages 245-285 in O. C. Wallmo, ed., Mule and black-tailed deer.

Connolly, G. E. 1988. M-44 sodium cyanide ejectors in the Animal Damage Control program, 1976-1986. Proc. Vertebr. Pest Conf. (A.C. Crabb and R.E. Marsh, eds.), Printed at Univ. Calif., Davis. 13: 220-225.

Connolly, G. E. 1992. Coyote damage to livestock and other resources. Pages 161-169 in A. H. Boer, ed., Ecology and management of the eastern coyote. Univ. of New Brunswick, Fredericton.

Connolly, G. E., and W. M. Longhurst. 1975. The effects of control on coyote populations. Bull. 1872, Div. Agric. Sci., Univ. Calif., Davis, CA.

Connolly, G. E., R. M. Timm, W. E. Howard, and W. M. Longhurst. 1976. Sheep killing behavior of captive coyotes. J. Wildl. Manage. 40: 400-407.

Conover, M. R. 1982. Evaluation of behavioral techniques to reduce wildlife damage. Proc. Wildl.-Livestock Relationship Sym. 10: 332-344.

Coolahan, C. 1990. The use of dogs and calls to take coyotes around dens and resting areas. Proc. Vertebr. Pest Conf. 14: 260-262.

Creed, R. F. S. 1960. Gonad changes in the wild red fox (Vulpes vulpes crucigera). J. Physiol. 151: 19-20.

Danner, D. A. 1976. Coyote home range, social organization, and scent post visitation. M.S. Thesis, Univ. Arizona, Tucson, AZ.

Danner, D. A., and N. S. Smith. 1980. Coyote home range, movement, and relative abundance near cattle feedyards. J. Wildl. Manage. 44(2): 484-487.

Decker, D. J. and G. R. Goff. 1987. Valuing wildlife: economic and social perspectives. Westview Press, Boulder, CO. 424 pages.

Decker, D. J. and K. G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. Wildl. Soc. Bull. 16(1): 53-57.

Decker, D. J., and L. C. Chase. 1997. Human dimension of living with wildlife - a management challenge for the 21st century. Wildl. Soc. Bull. 16: 53-57.

Delorenzo, D. G. and V. W. Howard, Jr. 1976. Evaluation of sheep losses on a range lambing operation without predator control in southeastern New Mexico. Final rep. U.S. Fish Wildl. Ser. Denver Wildl. Res. Center. 34 pp.

Edwards, L. L. 1975. Home range of coyotes in southern Idaho. M.S. Thesis, Idaho State Univ., Moscow, ID.

Engeman, R. M., H. W. Krupa, and J. Kern. 1997. On the use of injury scores for judging the acceptability of restraining traps. J. Wildl. Res. 2(2): 124-127.

Gantz, G. F. 1990. Seasonal movement patterns of coyotes in the Bear River Mountains of Utah and Idaho. M.S. Thesis. Utah State Univ., Logan. 67 pp.

GAO. 1990. Effects of Animal Damage Control program on predators. GAS/RCED-90-149 Report to the Honorable Alan Cranston, Senate.

Gese, E. M. 1999. Threat of predation: do ungulates behave aggressively towards different members of a coyote pack? Can. J. Zool. 77(3): 499-503.

Gese, E. M., and S. Grothe. 1995. Analysis of coyote predation on deer and elk during winter in Yellowstone National Park, Wyoming. Am. Midl. Nat. 133: 36-43.

Gese, E. M., O. J. Rongstad, and W. R. Mytton. 1988. Home range and habitat use of coyotes in southeastern Colorado. J. Wildl. Manage. 52: 640-646.

Gese, E. M., T. E. Stotts, and S. Grothe. 1996. Interactions between coyotes and red foxes in Yellowstone National Park, Wyoming. J. Mammal. 77: 377-382.

Gipson, P. S. 1978. Coyotes and related Canis in the southeastern United States with a comment on Mexican and Central American Canis. Page 199. In M. Bekoff, ed., coyotes: biology, behavior, and management. New York Academic Press.

Green, J. S. and R. A. Woodruff. 1983. The use of three breeds of dog to protect rangeland sheep from predators. Appl. Anim. Ethol. 11(2): 141-161.

Green, J. S. 1989. APHIS Animal Damage Control livestock guarding dog program. U. S. For. Serv. Gen. Tech. Rep. RM-171: 50-53.

Green, J. S. and R. A. Woodruff. 1996. Livestock guarding dogs: protecting sheep from predators. USDA, APHIS, Agriculture Information Bull. No: 588.

Gruver, K. S., R. L. Phillips, and E. S. Williams. 1996. Leg injuries to coyotes captured in standard and modified Soft Catch® traps. Proc. 17th Vertebr. Pest Conf. 17: 91-93.

Harris, S. 1977. Distribution, habitat utilization and age structure of a suburban fox (Vulpes vulpes) population. Mammal. Rev. 7: 25-39.

Harris, S. 1979. Age-related fertility and productivity in red fox, Vulpes vulpes, in suburban London. J. Zool. 187: 195-199.

Harris, S., and J. M. V. Rayner. 1986. Urban fox (Vulpes vulpes) population estimates and habitat requirements in several British cities. J. Anim. Ecol. 55: 575-591.

Harrison, D. J. 1992. Dispersal characteristics of juvenile coyotes in Maine. J. Wildl. Manage. 56(1): 128-138.

Harrison, D. J., J. A. Harrison, and M. O'Donoghue. 1991. Predispersal movements of coyote (Canis latrans) pups in eastern Maine. J. Mamm. 72(4): 756-763.

Henne, D. R. 1977. Domestic sheep mortality on a western Montana ranch. Pages 133-149 in R. L. Phillips, and C. Jonkel, eds. Proc. 1975 Predator Sym. Montana For. Conserv. Exp. Stn., School For., Univ. Montana, Missoula, MT.

Henry, D. 1986. Red fox. The catlike canine. Smithsonian Institution Press, Washington, D. C.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210-228 in M. Bekoff, ed., Coyotes: biology, behavior and management. Academic Press, New York, NY.

Horstman, L. P. and J. R. Gunson. 1982. Black bear predation on livestock in Alberta. Wildl. Soc. Bull. 10(1): 34-39.

Jahnke, L. J., C. Phillips, S. H. Anderson, and L. L. McDonald. 1988. Am. Soc. Test. Materials ASTM Spec. Tech. Publ. 974: 159-169.

Knowlton, F. F. 1972. Preliminary interpretations of coyote population mechanics with some management implications. J. Wildl. Manage. 36: 369-382.

Knowlton, F. F., E. M. Gese, and M. M. Jaeger. 1999. Coyote depredation control: an interface between biology and management.

Lavigne, G. R. 1995. A study of eastern coyotes and their impact on white-tailed deer in Maine. Report to the 117th Maine Legislature, Pursuant to LD 793 12 MRSA.

Leopold, A. S. 1933. Game management. Charles Scriber & Sons. NY, NY. 481 p.

Linhart, S. B., G. J. Dasch, R. R. Johnson, J. D. Roberts, C. J. Packham, and J. E. Borrecco. 1992. Electronic frightening devices for reducing coyote predation on domestic sheep: efficacy under range conditions and operational use. Proceeding of the 15th Vertebrate Pest Conference. 15: 386-392.

Loker, C. A., D. J. Decker, and S. J. Schwagner. 1999. Social acceptability of wildlife management actions in suburban areas: 3 cases from New York. Wildl. Soc. Bull. 27: 152-159.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. M.S. Thesis, Univ, of Mass., Amherst. 70 pp.

Lorenz, J. R., R. P. Coppinger, and M. R. Sutherland. 1986. Causes and effects of mortality in livestock guarding dogs. J. Range Manage. 39(4): 293-295.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. M.S. Thesis, Miss. State Univ., Starkville. 162 pp.

Lowney, M. S. 1996. Predator management training manual. Virginia Cooperative Extension. Publication 456-230.

MacDonald, D. W., and M. T. Newdick. 1982. The distribution and ecology of foxes Vulpes vulpes (L.) in urban areas. Pages 123-135 in R. Bornkamm, J. A. Lee, and M. R. D. Seaward, eds. Urban Ecology. Blackwell Sci. Publ., Oxford, U.K.

McAdoo, J. K. and D. A. Klebenow. 1978. Predation on range sheep with no predator control. J. Range Manage. 31(2): 111-114.

Meadows, L. E., and F. F. Knowlton. 2000. Efficacy of guard llamas to reduce canine predation on domestic sheep. Wildl. Soc. Bull. 28(3): 614-622.

Messier, F., and C. Barrette. 1982. The social system of the coyote (Canis latrans) in a forested habitat. Can. J. Zool. 60: 1743-1753.

Messier, F., C. Barrette, and J. Huot. 1986. Coyote predation on a white-tailed deer population in southern Quebec, Canada. Pages () in G. Parker, ed., Eastern coyotes: the story of their success.
Miller, L. A. 1995. Immunocontraception as a tool for controlling reproduction in coyotes. Pages 172-176 in D. Rollins, C. Richardson, T. Blankenship, K. Cann, S. Henke, eds. Proc. Symp. Coyotes in the Southwest.: A Compendium of Our Knowledge. Texas Parks Wildl. Dept., Austin, TX.

Moore, G. C. and G. R. Parker. 1992. Colonization by the eastern coyote (Canis latrans) Pages 23-37 in A. H. Boer, ed., Ecology and management of the eastern coyote.

Munoz, J. R. 1977. Causes of sheep mortality at the [redacted], Montana, 1975-76. M.S. Thesis. Univ. Mont. 55 pp.

NASS. 1977. Mortality associated with range sheep operations in Idaho. J. Range Manage. 30: 253-258

NASS. 1980. Efficacy of predator damage control programs. Proc. Vertebr. Pest Conf. 9: 205-208.

NASS. 1996. Cattle predator loss. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

NASS. 1999. 1999 Livestock wildlife damage survey results. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

NASS. 2000. Sheep and goats predator loss. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

NASS. 2001. Statistics of cattle, hogs, and sheep. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

Nelson, A. L. 1933. A preliminary report on the winter food of Virginia foxes. J. Mammal. 14(1): 40-43.

Nielsen, L. 1988. Definitions, considerations and guidelines for translocation of wild animals. Pages 12-49 in Translocation of wild animals. Ed. L. Nielsen and R. D. Brown. WI Humane Society, Inc. and Ceaser Kleberg Wildlife Research Instit. 333 pp.

Novak, M. 1987. Traps and trap research. Pages 941-969 in M. Novak, J.A. Baker, M.E. Obbard, and B. Mallock, eds., Wild furbearer management and conservation in North America.

ODA. 2000. 1999 Ohio Department of Agriculture annual report and statistics. 136 pp.

O'Gara, B. W., K. C. Brawley, J. R. Munoz, and D. R. Henne. 1983. Predation on domestic sheep on a western Montana ranch. Wildl. Soc. Bull. 11: 253-264.

Olsen, G. H., S. B. Linhart, R. A. Holmes, G. J. Dasch, and C. B. Male. 1986. Injuries to coyotes caught in padded and unpadded steel foothold traps. Wildl. Soc. Bull. 14(3): 219-223.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. J. Wildl. Manage. 30(4): 809-818.

Parker, G. 1995. Eastern Coyote: The story of its success. Nimbus Publishing Limited. P.O. Box 9301, Station A, Halifax, N.S. B3K 5N5.

Pfeifer, W. K., and M. W. Goos. 1982. Guard dogs and gas exploders as coyote depredation control tools in North Dakota. Proc. Vertebr. Pest Conf. 10: 55-61.

Phillips, R. L. 1970. Age ratio of Iowa foxes. J. Wildl. Manage. 34: 52-56.

Phillips, R. L. 1996. Evaluation of 3 types of snares for capturing coyotes. Wildl. Soc. Bull. 24(1): 107-110.

Phillips, R. L. and C. Mullis. 1996. Expanded field testing of the no. 3 victor soft catch trap. Wildl. Soc. Bull. 24(1): 128-131.

Phillips, R. L., and K. S. Gruver. 1996. Performance of the Paws-I-Trip® pan tension device on 3 types of traps. Wildl. Soc. Bull. 24: 119-122.

Phillips, R. L., and L. D. Mech. 1970. Homing behavior of a red fox. J. Mammal. 51: 621.

Phillips, R. L., F. S. Blom, and R. E. Johnson. 1990. An evaluation of breakaway snares for use in coyote control. Proc. 14th Vertebr. Pest Conf., (L.R. Davis and R.E. Marsh, Eds.) Published at Univ. of Calif., Davis.

Phillips, R. L., K. S. Gruver, and E. S. Williams. 1996. Leg injuries to coyotes captured in three types of foothold traps. Wildl. Soc. Bull. 24(2): 260-263.

Pils, C. M., and M. A. Martin. 1978. Population dynamics, predator-prey relationships and management of the red fox in Wisconsin. Tech. Bull. 105, Wisconsin Dept. Nat. Resour., Madison, WI.

Pyrah, D. 1984. Social distribution and population estimates of coyotes in north-central Montana. J. Wildl. Manage. 48(3): 679-690.

Robel, R. J., A. D. Dayton, F. R. Henderson, R. L. Meduna, and C. W. Spaeth. 1981. Relationships between husbandry methods and sheep losses to canine predators. J. Wildl. Manage. 45(4): 894-911.

Rowlands, I. W., and A. S. Parkes. 1935. The reproductive processes of certain mammals. VIII. Reproduction in foxes (Vulpes spp.). Proc. Zool. Soc. London, pp. 823-841.

Rowley, G. J., and D. Rowley. 1987. Decoying coyotes with dogs. Proc. Great Plains Wildl. Damage Control Workshop 8: 179-181.

Sacks, B. N., K. M. Blejwas, and M. M. Jeager. 1999a. Relative vulnerability of coyotes to removal on a northern California ranch. Journal of Wildlife Management 63: 939-949.

Sacks, B. N., M. M. Jeager, J. C. C. Neale, and D. R. McCullough. 1999b. Territoriality and breeding status of coyotes relative to sheep predation. Journal of Wildlife Management 63: 593-605.

Samuel, D. E. and B. B. Nelson. 1982. Foxes. Pages 475-490 in J. A. Chapman and G. A. Feldhamer, eds. Wild Mammals of North America. The John Hopkins University Press, Baltimore, MD.

Sanborn, W. A., R. H. Schmidt, and H. C. Freeman. 1994. Policy considerations for contraception in wildlife management. Proc. 16th Vertebr. Pest Conf. 16: 311-316.

Sargeant, A. B. 1972. Red fox spatial characteristics in relation to waterfowl predation. J. Wildl. Manage. 36: 225-236.

Sargeant, A. B. 1978. Red fox prey demands and implications to prairie duck production. J. Wildl. Manage. 42: 520-527.

Schmidt, R. H. 1989. Vertebrate pest control and animal welfare. Pages 63-68 in ASTM STP 1055. Vertebrate Pest Control and Management Materials. Vol. 6. K. A. Fagerstone and R. D. Curnow, eds. American Society for Materials and Testing, Philadelphia.

Shaw, H. G. 1977. Impact of mountain lion on mule deer and cattle in northwestern Arizona. Pages 17-33 in R. L. Phillips and C. Jonkel, eds., Proc. 1975 Pred. Symp. Mont. For. Conserv. Exp. Station., Univ. Mont.

Shaw, H. G. 1981. Comparison of mountain lion predation on cattle on two study areas in Arizona. Pages 306-318 in Proc. Wildl.-Livestock Relationships Symp., For. Wildl. and Range Exp. Station, Univ. Idaho, Moscow.

Sheldon, W. G. 1950. Denning habits and home range of red foxes in New York State. J. Wildl. Manage. 14: 33-42.

Shelton, M. and J. Klindt. 1974. The interrelationship of coyote density and certain livestock and game species in Texas. Texas Agricul. Exp. Station (MP-1148).

Slate, D. A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. North Am. Wildl. Nat. Resour. Conf. 57: 51-62.

Snow, C. J. 1967. Some observations on the behavioral and morphological development of coyote pups. Amer. Zool. 75: 353-355.

Stoddart, L. C., and R. E. Griffiths. 1986. Changes in jackrabbit and coyote abundance affect predation rates on sheep. Denver Wildl. Res. Cent., Denver, CO. (unpubl. rep.)

Storm, G. L., R. D. Andrews, R. L. Phillips, R. A. Bishop, D. B. Siniff, and J. R. Tester. 1976. Morphology, reproduction, dispersal, and mortality of midwestern red fox populations. Wildl. Monogr. 49: 1-82.

Tabel, H., A. H. Corner, W. A. Webster, and C. A. Casey. 1974. History and epizoology of rabies in Canada. Can. Vet. J. 15: 271-281.

The Wildlife Society. 1990. Conservation policies of the Wildlife Society. The Wildlife Society, Wash., D.C. 20pp.

Thomas, E. S. 1951. Distribution of Ohio animals. Ohio J. Sci. 51(4): 153-167.

Till, J. A. 1992. Behavioral effects of removal of coyote pups from dens. Proc. Vertebr. Pest Conf. 15:396-399.

Till, J. A. and F. F. Knowlton. 1983. Efficacy of denning in alleviating coyote depredations upon domestic sheep. J. Wildl. Manage. 47(4):1018-1025.

Tinger, J. R., and G. E. Larson. 1977. Sheep losses on selected ranches in southern Wyoming. J. Range Manage. 30: 244-252.

Todd, A. W., and L. B. Keith. 1976. Responses of coyotes to winter reductions in agricultural carrion. Wildl. Tech. Bull. 5, Alberta Recreation, Parks Wildl., Edmonton, Alberta, Canada.

Tullar, B. F., Jr., L. T. Berchielli, Jr., and E. P. Saggese. 1976. Some implications of communal denning and pup adoption among red foxes in New York. New York Fish Game J. 23: 93-95.

Turkowski, F. J., A. R. Armistead, and S. B. Linhart. 1984. Selectivity and effectiveness of pan tension devices for coyote foothold traps. J. Wildl. Manage. 48(3): 700-708.

USDA. 1997a. Final Environmental Impact Statement. U.S. Dept. Agric., Anim. Plant Health Inspection Serv., Animal Damage Control, Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737.

USDA. 1997b. Managing wildlife damage: the mission of APHIS' Wildlife Services Program. U.S. Dept. Agric., Anim. Plant Health Inspection Serv., Misc. Publication No. 1543.

USDI. 1979. Mammalian predator damage management for livestock protection in the Western United States. Final Environmental Impact Statement. U.S. Fish Wildl. Serv., Washington, DC.

USDI. 1992. Biological opinion on the USDA-APHIS-ADC Program. U.S. Fish and Wildlife Serv., Wash., D.C. 69pp.

Voigt, D. R. 1987. Red Fox. Pages 378-392 in M. Novak, J. A. Baker, M. E. Obbard, and B. Mallock, eds. Wild Furbearer Management and Conservation in North America. Ministry Nat. Resour., Toronto, Ontario, Canada.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. J. Wildl. Manage. 47: 852-857.

Voigt, D. R., and D. W. MacDonald. 1984. Variation in the spatial and social behavior of the red fox, Vulpes vulpes. Acta. Zool.Fenn. 171: 261-265.

Warner, S. A., R. L. Tucker, J. M. Crum, and A. C. Glasscock. 2001. 2000 West Virginia Bowhunter Survey. Wildlife Resources Section Bulletin 01-7. West Virginia Division of Natural Resources, Elkins, WV.

Wagner, F. H. 1988. Predator Control and the Sheep Industry: The Role of Science in Policy Formation. Regina Books. Claremont, CA. 230 pp.

Wagner, K. K., and M. R. Conover. 1999. Effect of preventative coyote hunting on sheep losses to coyote predation. Journal of Wildlife Management 63: 606-612.

Weeks, J. L., G. M. Tori, and M. C. Shieldcastle. 1990. Coyotes (*Canis latrans*) in Ohio. Ohio J. Science. 90: 142-145.

West Virginia Code of 1931, as Amended. Michie Co., Charlotteville, VA.

Windberg, L. A. and F. F. Knowlton. 1988. Management implications of coyote spacing patterns in southern Texas. J. Wildl. Manage. 52: 632-640.

Windberg, L. A., F. F. Knowlton, S. M. Ebbert, and B. T. Kelly. 1997. Aspects of coyote predation on Angora goats. J. Range Manage. 50: 226-230.

Witmer, G. W., M. J. Pipas, and A. Hayden. 1995. Some observations on coyote food habits in Pennsylvania. J. Penn. Acad. Sci., 69(2): 77-80.

APPENDIX B: COYOTE DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDED BY THE WEST VIRGINIA WILDLIFE SERVICES PROGRAM

PRODUCER-IMPLEMENTED NON-LETHAL METHODS

Producer implemented non-lethal control methods consist primarily of non-lethal preventive methods such as habitat modification and husbandry . Husbandry and other management techniques are implemented by the livestock producer. Livestock producers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

Habitat modification is used whenever practical to attract or repel certain wildlife species or to separate livestock from predators. For example, WS may recommend that a producer clear rock, brush, or trash piles near lambing or calving pastures to reduce available cover for predators.

Animal husbandry practices include modifications in the level of care or attention given to livestock (depending on the age and size of the flock or herd). Animal husbandry practices include, but are not limited to, the use of:

- **Guard animals** used in livestock protection are dogs, donkeys, and llamas. These animals can effectively reduce predator losses in some situations (Knowlton et al. 1999). Guard dogs most frequently used are Maremma and Great Pyrenees breeds. Anatolian shepherds and Akbash breeds are also effective. Success in using guard dogs is highly dependent on proper breeding and bonding with the type of livestock the dog is to protect. Effective use of guard dogs depends on training, obedience, care, and feeding (Green and Woodruff 1996). The efficacy of guard dogs is affected by the amount of predation loss, size and topography of the pasture, acceptance of the dog by the livestock, training, compatibility with humans, and compatibility with other predator control methods. Guard dog breeds mature at about 2 years of age and may begin protecting livestock at this age. Guard dogs have an effective working life of less than three years because of accidents, disease, and people misidentifying the guard dog as a threat to the livestock (Lorenz et al. 1986, Green 1989). Guard dogs may kill, injure, harass, or rape sheep and goats (Green and Woodruff 1983). The success of guard dogs in other programs (e.g., Virginia) is highly variable with a few livestock producers claiming all coyote predation stopped and some livestock producers reporting no effectiveness at stopping predation. Most livestock producers report they believe there was a reduction in coyote predation.

  Guard llamas have also been used with mixed success to protect livestock, but are typically aggressive toward dogs and appear to readily bond with sheep (Cavalcanti and Knowlton 1998). Llamas can be kept in fenced pastures, do not require special feeding programs, are usually tractable, and have a relatively long working life compared with guard dogs (Knowlton et al. 1999). Meadows and Knowlton (2000) found llamas were able to reduce predation on sheep initially, but dogs and coyotes adapted to the protective nature of llamas over time, thus reducing their effectiveness.

  Guard donkeys have been used to protect livestock with mixed results. The reported most effective guard donkey is a jenny with a foal. Guard donkeys are probably more effective at deterring dog predation than coyote predation.

- **Herders** or shepherds stay with the flock all day and night. This method historically was used with roving bands of sheep. It is rarely used in West Virginia because sheep and goats are confined to fenced pastures.

- **Barn/shed lambing** is birthing lambs, kids (baby goats), or calves in buildings. Lambs and goats may be born and kept in a building for the first one to two weeks of life. Cattle are rarely birthed in buildings because of cost, size, and number of buildings which would be required. Birthing in buildings adds additional labor costs and raises disease concerns among livestock producers. While this may initially enhance survival of young animals, predators may still remove young animals when they are placed out on pasture.

- **Carcass removal** is burying or incinerating dead livestock to remove an attractant for predators.

- **Pasture selection/rotation** is placing or moving sheep, goats, or cattle in pastures believed less likely to expose livestock to predation. Usually, moving livestock to pastures near human habitation is believed to expose livestock to fewer predators. Livestock producers eventually must move livestock to distant pastures to graze; however, they may wait until lambs, kids, and calves are larger and older in the hope to reduce their vulnerability to predation.

MECHANICAL MANAGEMENT METHODS

Mechanical management methods consist primarily of tools or devices used to repel, capture or kill a particular target animal or local population of wildlife to alleviate resource damage. All mechanical management methods can be used by livestock producers if they have the knowledge, ability, and time. Mechanical methods are non-lethal devices. Although restraining devices (e.g., cage traps, foothold traps, snares) are perceived as a lethal control methods, they are designed to hold the target animal until they can be humanely dispatched. If WS personnel apply mechanical methods on private lands, an *Agreement for Control on Private Property* must be signed by the landowner or administrator authorizing the use of each damage management method. Mechanical methods used by WS may include:

Animal behavior modification refers to tactics that deter or repel predators and thus, reduce predation. Unfortunately, many of these techniques are only effective for a short time before wildlife habituate to them (Pfeifer and Goos 1982, Conover 1982). Devices used to modify behavior include:

- **Predator-resistant fences** are woven wire or 9 or 11 strand electric fences. Woven wire fences generally are four-feet tall and may have a barb wire along the bottom of the fence to deter digging under by predators. Electric fences may be less expensive to erect but coyotes, dogs, and other wildlife can pass through electric fences. Electric fences must be maintained and tested regularly. Vegetation and fallen branches on the fence drain current, thus reducing efficacy. Additionally, dry soil conditions prevent grounding, and thus the animal can pass through the fence without being shocked. Electric fences also make the use of snares very difficult because of the reduced ability to detect where coyotes are passing through the fence.

- **Temporary fencing** is placing temporary electric polytape fence in a bedding area to deter predation for a day to a week or more while the livestock producer moves the animals to another pasture or market. The livestock must be released each morning to feed and water. The temporary fence may need to be moved daily to provide clean pasture for bedding because of the accumulation of fecal droppings which may foul and mat the sheep or goat wool/hair.

- **Electronic guards (siren strobe-light devices)** are battery powered units operated by a photocell. The unit emits a flashing strobe light and siren call at irregular intervals throughout the night. Efficacy of strobe-sirens is highly variable and usually lasts only a few weeks. The device is a short-term tool used to deter predation until livestock can be moved to another pasture, brought to market, or other predator control methods implemented.

Foothold traps can be utilized to live-capture a variety of mammals, but would primarily be used by the West Virginia WS program to capture coyotes, feral dogs, and red foxes. Foothold traps are difficult to

keep operational during inclement weather, but when properly implemented can be highly selective. The use of foothold traps requires more time, expertise, and labor than some methods, but they are indispensable in resolving many depredation problems. Three advantages of the foothold trap are: 1) they can be set under a wide variety of situations, 2) pan-tension devices can be used to reduce the probability of capturing smaller non-target animals (Turkowski et al. 1984, Phillips and Gruver 1996), and 3) non-target wildlife can be released. Effective trap placement and the use of appropriate baits and lures by trained WS personnel also contribute to the foothold trap's selectivity.

Foothold traps are constantly being modified and tested to improve animal welfare of captured animals. The BMP testing process has identified some foothold traps that have acceptable capture efficiency and low-moderate-severe injury scores. This BMP process is ongoing and all traps which currently meet BMP standards will not be known until 2002. Additional traps may be identified in the future as part of this ongoing process. Modifications will be implemented by WS to improve animal welfare and may include adding pan tension devices to exclude non-target animals, center swiveling to reduce injuries from twisting, and shock springs in the chain which anchors the trap to reduce lunging injuries. Jaws are without teeth and may have rubber pads attached. Jaws may be offset to keep them from coming together which reduces pressure on the animals foot. Also, the thickness of the jaws may vary to better distribute pressure on the animal's foot. Novak (1987) and Boggess et al. (1990) describe and diagram many types of foothold traps used throughout history in North America. Traps that the West Virginia WS program use, but would not be limited to, include the Woodstream Victor #3 padded jaw modified with 4 coils, a reinforced base plate, and bubble-tip welded jaws (Gruver et al. 1996) and the Sterling MJ600/MB650 #3 coil spring offset jaw foothold trap. Our primary foothold trap is the Number 3 Bridger with laminated jaws and four-coils. This trap was tested in Canada and passed the BMP process for capture efficiency and animal welfare.

Cage traps, typically constructed of wire mesh or plastic, are sometimes used or recommended to capture dogs. Cage traps pose minimal risks to humans, pets and non-target wildlife and allow for on-site release or relocation of dogs. However, cage traps are not effective in capturing wary predators such as coyotes and red foxes.

Snares may be used in West Virginia and are generally made of small diameter cable (e.g., 5/64 or 3/32 inch diameter cable) with a locking mechanism which stops closing when an animal stops pulling against the snare. Snares may be placed where an animal moves through a confined area (e.g., crawl holes under fences, trails through vegetation, etc.) and are easier to keep operational during periods of inclement weather than are foothold traps. Snares are set to catch canines by the neck and/or shoulder; however, snares may occasionally capture an animal around the body or leg. Deer stops allow the snare cable to close to a diameter of not less than 2 ½ inches and allow deer or other animals captured by the leg to escape. Another effective method is the use of break-away snares that allow larger non-target animals to break the snare and escape (Phillips et al. 1990, Phillips 1996).

Shooting is the practice of selectively removing target individuals by shooting with a rifle or shotgun. Shooting with rifles or shotguns may be used to manage predation problems when lethal methods are determined to be appropriate. Shooting may involve the use of spotlights, night-vision, decoy dogs, and predator calling. The target animal is killed as quickly and humanely as possible. Removal of one or two specific animals by calling and shooting in the problem area can sometimes provide immediate relief from a predation problem. Because this method can be time consuming and inefficient, it is rarely used by WS.

Hunting dogs are sometimes trained and used for coyote damage management to alleviate livestock depredation (Rowley and Rowley 1987, Coolahan 1990). Trained dogs are used primarily to find coyotes and dens and to pursue or decoy problem animals. Dogs could be essential to the successful location of coyote sign (tracks, hair, or droppings).

Denning is the practice of finding predator dens and eliminating the young, adults, or both to stop an ongoing predation problem or prevent future depredation on livestock. Till and Knowlton (1983) documented denning's cost effectiveness and high degree of efficacy in resolving predation problems due to coyotes killing lambs in the spring. Coyote and red fox depredations on livestock often increase in the spring and early summer due to the increased food requirements associated with feeding and rearing litters of pups. Removal of pups will often stop depredations even if the adults are not taken (Till 1992). Pups are typically euthanized in the den using a registered gas fumigant cartridge (see discussion of Large Gas Cartridge under Chemical Management Methods).

Sport hunting and regulated trapping will be recommended as part of the IWDM approach to reduce local predator populations in areas that have historically had livestock losses. Hunters and trappers can provide a societal benefit by reducing local wild animal populations which can reduce damage. Although coyotes are considered a furbearer in West Virginia, they may be hunted or trapped anytime with a legal hunting permit. Red and gray fox may be hunted or trapped from November - January statewide with a trapping license. See the *West Virginia 2001-2002 Hunting and Trapping Regulations Summary* provided by the WVDNR for more information on seasons, limits and regulations. WS will work closely with the West Virginia Trappers Association (WVTA) to locate trappers that could assist livestock producers during the legal fur harvest season. These volunteers will be recommended to producers when and where deemed appropriate by WS.

CHEMICAL MANAGEMENT METHODS

All chemicals used by WS to protect livestock are registered under the FIFRA and administered by the EPA and WVDA, Pesticide Division. All WS personnel in West Virginia that use pesticides are registered as restricted-use pesticide applicators by WVDA, Pesticide Division; which requires pesticide applicators to adhere to all certification requirements set forth in the FIFRA. No chemicals are used on private lands without authorization from the property owner or manager. The chemical methods listed below are registered for use in the State of West Virginia.

The **M-44 sodium cyanide device** is a spring-activated ejector device developed specifically to kill coyotes, although it is also registered with the EPA (EPA Reg No. 56228-15) to kill red foxes and feral dogs. The M-44 consists of a capsule holder wrapped in an absorbent material, an ejector mechanism, a capsule containing about 0.9 grams of a powdered sodium cyanide mixture, a fluorescent marker, and a 6-7 inch hollow stake. To set a M-44, a suitable location is found, the hollow stake is driven into the ground, and the ejector unit is cocked and fastened into the stake by a slip ring. The wrapped capsule holder containing the cyanide capsule is then screwed onto the ejector unit and a coyote attractant is applied to the capsule holder. A canine attracted to the bait will try to bite and pick up the baited capsule holder. When the M-44 capsule holder is pulled, the spring-activated plunger propels sodium cyanide into the animal's mouth, resulting in a quick death. Coyotes killed by M-44's present no secondary poisoning risks (USDA 1997a, Appendix P, pages 269-271), thus animals which may feed on a predator killed by an M-44 will be unaffected. Bilingual (English-Spanish) warning signs are posted at major entries into the area where M-44's are placed, and another bilingual warning sign is placed within 25 feet of each M-44 to warn of each device's presence.

The M-44 is very selective for canids because of the attractants used and because the device is triggered by pulling upward. Connolly (1988), in an analysis of M-44 use by the WS program from 1976-1986, documented about a 99% selectivity rate for target species (excluding skunks) in Nebraska. Domestic dogs are susceptible to M-44s, and this limits the areas where the devices can be safely used (see SOPs in Chapter 3). In addition, the 26 EPA use restrictions preclude the use of M-44's in areas where they may pose a danger to T&E species. The M-44 can be used effectively during winter months when foothold traps are difficult to keep in operation and M-44's are typically more selective for target canid species than foothold traps.

M-44's are used for corrective and preventive damage management on all land classes where authorized. WS personnel comply with the EPA label and 26 use restrictions (see USDA 1997a, Appendix Q).

Livestock Protection Collars are registered as a toxic collar with the EPA (Reg. No. 56228-22) and is registered for use on sheep or goats to kill depredating coyotes. The LPC consists of a rubber collar with two rubber reservoirs, each of which contains 15 milliliters of a 1-percent solution of sodium fluoroacetate (Compound 1080). The LPC has Velcro straps for attachment around the neck of a sheep or goat with the reservoirs positioned just behind the jaw. Two collar sizes are available to accommodate various size livestock.

Coyotes typically attack sheep and goats by biting them on the throat and crushing the larynx, causing suffocation. Coyotes that attack collared sheep generally puncture the collar with their teeth (in 75% or more of attacks) and receive a lethal oral dose of toxicant.

Use of the LPC involves the establishment of a "target flock" of 20-50 collared lambs and their ewes. These animals are placed in a high risk pasture where recent coyote attacks have occurred. Other (uncollared) livestock on the farm are moved to a safe area or are penned until predation stops.

The greatest advantage of the LPC is its selectivity. Only coyotes causing damage are killed. Disadvantages of the collar include the death of some collared livestock by coyotes, time and cost of certification required to use collars, potential hazards associated with the toxicant under field conditions, expense of collaring and monitoring target animals, mandatory record keeping, and management efforts needed to protect livestock displaced from the target flock's location.

Numerous restrictions apply to the use of LPC's and are specified in the EPA approved LPC technical bulletin which is part of the restricted use pesticide label.

The **Large Gas Cartridge** is registered as a fumigant by the EPA (Reg. No. 56228-21) and is used in conjunction with denning operations. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, and tasteless, poisonous gas. The combination of oxygen depletion and carbon monoxide exposure kills the animals in the den. Carbon monoxide euthanasia is recognized by the AVMA as an approved and humane method to euthanize animals (AVMA 2000).